E. E. Prince
Commissioner of Fisheries

SEVENTEENTH

ANNUAL REPORT

OF THE

DEPARTMENT

OF

MARINE AND FISHERIES

BEING FOR THE

FISCAL YEAR ENDED 30TH JUNE,

1884.

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APPENDIX No. 30.

REPORT OF THE HUDSON'S BAY EXPEDITION, UNDER THE COMMAND OF LIEUT. A. R. GORDON, R.N., 1884.

METEOROLOGICAL OFFICE, TORONTO, 1884.

The Honorable A. W. McLELAN,
Minister Marine and Fisheries,
Ottawa.

SIR,—I have honour to submit, herewith, my report on the conduct of the Hudson's Bay Expedition of this year, under my command.

I desire to acknowledge the cordial assistance and co-operation which I received from Dr. Bell, who was appointed as medical officer and geologist to the expedition; and also from Mr. W. W. Fox, who accompanied the expedition as a volunteer. Both Mr. Fox and Dr. Bell took large numbers of photographs of the various posts and the scenery of the coast. Mr. Fox also made free-hand sketches of the coast profile, at many points, for me.

Dr. Bell's report forms Appendix A to this Report.

Appendix B is a series of tables showing temperature, &c., at Fort Chimo, in Ungava Bay, taken by Mr. Lucien M. Turner, of the United States Signal Service, which he has favored us with, by kind permission of General Hazen, the chief signal officer of the United States army.

Of the officers and men forming the staff of the expedition, it gives me much pleasure to report that they, each and all, performed the several duties assigned to them in the most satisfactory manner.

The Report submitted herewith is divided into the following sections:—

1st. Narrative.

2nd. Navigation—including Ice, Currents and Meteorological Observations.

3rd. Resources of the Region.

4th. Trade.

5th. Natural History, Inhabitants and Fauna.

6th. Proposed Work for next Year.

Appendix A.—Report of R. Bell, Esq., M.D., F.G.S.

Appendix B.—Observation, at Ungava Bay, by L. M. Turner, Esq., United States Signal Service.

I have the honour to be, Sir,
Your obedient servant,
ANDREW R. GORDON, Lieut., R.N.,
Commanding H. B. Expedition.

The Honorable A. W. McLelan,
Minister Marine and Fisheries,
Ottawa.

Sir,—I have the honour to report, relative to the Hudson's Bay Expedition, that, in accordance with your letter of instructions, dated 5th July, I proceeded to Halifax, N.S., and took charge of the preparations for the expedition.

On the 14th of the same month I received the following note from Messrs. S. Cunard and Co. :—

"Halifax, N.S., 14th July, 1884.

'Lieut. A. R. Gordon, R.N.,
"Halifax, N.S.

"Dear Sir,—In accordance with instructions received from Messrs. Job Bros., we "this day hand over to you the S.S. 'Neptune,'

"Yours truly,
"S. CUNARD & CO., *Agents.*"

The "Neptune" having been placed at the disposal of the Department, the greatest dispatch was used in coaling and putting on board the supplies for the expedition, and at two o'clock in the afternoon of Tuesday, 22nd July, the coals, lumber and other supplies being on board, the members of the expedition embarked, and one hour later we left our moorings at the Marine Wharf for Hudson's Bay.

The staff of the expedition was composed as follows:—

Robert Bell, M.D., F.G.S., of Ottawa, geologist and medical officer.

Messrs. R. F. Stupart, of Toronto; C. R. Tuttle, of Winnipeg; W. A. Ashe, of Quebec; C. V. Deboucherville and A. N. Laperriere, of Ottawa; William Skynner, of Springfield, Ont.; H. M. Burwell, of London, Ont.; and H. T. Bennett, observers.

Mr. W. W. Fox, of Toronto, photographer.

Messrs. Yeadon, McNeill and Quigley, carpenters.

Messrs. R. Currie, J. E. Campbell, H. M. Rainsford, W. H. Jordan, M. W. Keating, Fred. Drysdale, Jno. W. Chaplin, John W. McDaniel, W. F. Esdaile, Andrew Inglis, Adam Maher and Robert Youill, stationmen.

The officers and men, who remained out all winter, had each of them been examined by medical men, and pronounced physically well-fitted to withstand the rigors of an Artic climate.

The expedition touched at Blanc Sablon on the 26th of July, and on the evening of Tuesday the 29th anchored in Ford's Harbour, at the east end of Paul's Island. At this place I went on shore and arranged with Mr. Ford to pilot us into Nain. He boarded the "Neptune" at daylight the following morning, and by nine o'clock we had anchored off the Nain Mission House.

I visited this place in the hope of obtaining furs for the men who were to remain at the stations during the winter, and of being able to engage Eskimo interpreters. I secured a few articles of fur clothing, but there were no interpreters to be had. The Chief Superintendent of the Mission told me, however, that, in all probability, I would be able to procure some fur clothing, and interpreters as wel at the Hudson's Bay Co.'s Post at Nachvak, still further to the north, on the Labrador coast.

We remained at Nain during the day and were kindly treated by the mission aries who, besides imparting religious instruction to the natives, carry on an extensive trade with them. They have six stations in all on this coast, of which Nain is the capital. The others are Hopedale, Zoar, Hebron, Okkak and Ramah. During the day I took observations to ascertain the dip of the magnetic needle and vibrations for horizontal force, but was unable to obtain sights for the error of the chronometer or variation, owing to the inclemency of the weather.

During the voyage from the Gulf of St. Lawrence to this place we met with a great number of icebergs, both in the Straits of Belle Isle, and off the Labrador coast, north of it.

The expedition left Nain about 4:30 o'clock on the morning of 31st July, and reached Nachvak Bay about noon on the 1st of August, and cast anchor before the Hudson's Bay Co.'s post at Nachvak, about 4 o'clock in the afternoon. Here I met Mr. George Ford, the agent of the Hudson's Bay Company and a brother of our Nain pilot. From him and from the natives in the vicinity I purchased some skin clothing, and through his kind assistance was enabled to procure the services of Mr. James Lane, an Eskimo half-breed of Nachvak Bay as interpreter.

I learned from Mr. Ford that ice takes over the harbour of Nachvak, latitude 59° 10′ N., longitude 63° 30′ W., about the middle of November in each year and that for the last seven years it has broken up within a day of the 26th of June in each year.

On the 2nd of August, at daylight, we left the post at Nachvak, and after taking Mr. Lane on board at the mouth of the Bay, proceeded to sea for Cape Chidley. On the morning of the 3rd—Sunday—the fog was so dense that we were compelled to stand off to sea, and lie to. Noon position, lat. 60° 51′ N., long. 64° 14′ W., D. R.

The fog continuing, we were obliged to lay to all day Sunday, all night Sunday night, all day Monday, and all night Monday night, off the entrance to Hudson Strait. Noon position Monday, 4th August, D.R. lat. 61° 12′ N., long. 64° 13′ W.

At daylight on Tuesday, 5th August, the weather was clearing, and by sunrise it was bright and fair. At noon we were approaching Cape Chidley, having been carried some forty miles to the south whilst laying-to in the fog. We steamed through Grey Strait, between the Cape and the Button Islands, keeping a close look out for a harbour. At three o'clock in the afternoon we anchored in a fine harbour on the north-western shore of the Cape, at the entrance to Ungava Bay.

On the shore of this harbour I selected the site for Observing Station No. 1, and named the place Port Burwell, after the observer appointed to that station. Two families of Eskimos were discovered about six miles distant from Port Burwell.

The work of landing lumber and supplies was begun at once, and by 4 o'clock on the afternoon of Friday the 8th, the buildings were up and all was in readiness for departure. I placed Mr. H. M. Burwell, of London, Ontario, in charge of this station, with Messrs. Currie and Campbell as stationmen, and besides giving him full directions verbally, left with him, as also with each of the other observers, a copy of the following general instructions:—

INSTRUCTIONS TO OFFICERS IN CHARGE OF STATIONS IN HUDSON'S BAY AND STRAITS.

As the primary object of the whole expedition is to ascertain for what period of the year the Straits are navigable, all attention is to be paid to the formation, breaking up and movements of the ice.

Each station is supplied with a sun dial and time piece, and the clock is to be tested each day when there is sunshine about noon. A table of corrections is supplied for the reduction of apparent time to local mean time, to this the difference of time will be applied to 75th meridian, all entries being made in the time of this meridian, and observations will be taken regularly at the following times throughout the year, viz., 3 h. 08 m., 7 h. 08 m., 11 h. 08 m., a.m. and p.m.

Each morning the sums and means of the observations taken on the previous day will be taken out and checked over, they will then be entered in the abstract books supplied for the purpose.

After each observation during day light the observer on duty will take the telescope and carefully examine the Straits, writing down *at the time* all that he sees, stating direction and (when possible) velocity of tide, movement of ice, if any, also describe the condition of the ice, whether much broken up, solid field, &c., &c.

Tidal Observations.—Each day the time and height of high and low water is to be carefully observed, and during the open season the character of the tide will be carefully noted for two days before and three days after the full and change of the moon. For this purpose a post marked off in feet and fractions of a foot is to be placed in the water, at low water in some sheltered spot, if any such be available,

and the height of the water noted every half hour during the rise and fall of one tide on each of these days—the height to be noted most carefully every five minutes during the hour of high water and the same at low water—the five minute observations will also be taken for one hour during the most rapid portion of the rise. Special observations of barometric pressure are to be taken in connection with these tidal observations.

To check the zero mark for the tidal observation post, select a spot on shore from which the horizon line will be projected on the tidal post, and record the reading of this line when seen projected on the post by the observer, whose eye is to be placed at a measured height above the datum point selected on shore.

All remarks in regard to the movements of birds, fish, &c., and also as to the growth of grasses, will be carefully entered.

As it is impossible to give to the officers in charge of stations detailed instructions which would be of service in every contingency which might arise, the officers are required to observe and enforce the following rules:—

(*a.*) Every possible precaution is to be taken against fire, and as it is anticipated that the temperature can be maintained considerably above the freezing point inside the houses, two buckets full of water are always to be kept ready for instant use.

(*b.*) As the successful carrying out of the observations will, in a great measure, depend on the health of the party, the need of exercise is strongly insisted on during the winter months, and also that each member of the party shall partake freely of the lime juice supplied.

(*c.*) Each party is supplied with a boat, but unless some emergency required it, it must be a rule that neither afloat nor ashore must any of the party leave the station for a greater distance than they can be sure of being able to return the same day.

(*d.*) As soon as possible after the houses are completed and the stores all in place, the party will set to work collecting sods, grass or any other non-conducting material, and before the winter sets in the whole house is to be covered with this, boards overlaid and snow packed over all; the assistance of the Esquimaux should, if possible, be obtained, and the whole house arched over with snow.

ANDREW R. GORDON, Lieut. R.N.,
Commanding Expedition.

OTTAWA, 5th July, 1884.

The expedition left Port Burwell at 5 o'clock on the evening of the 8th, and shaped course for the Lower Savage Islands, where it was intended that Station No. 2 should be placed. On the following morning there was a dense fog until 8 o'clock, when it lifted, and at 9 o'clock we sighted Resolution Island. We passed a number of icebergs in the forenoon, and passed between Resolution Island and the Lower Savage Islands to East Bluff, then going about and steering along the south coast of the Lower Savages.

We spent the day in looking for an anchorage at the Lower Savages, and on a portion of the north main coast, a boat was sent ashore twice to examine what appeared to be possible harbours; but, on both occasions, the report was unfavourable; there was a stiff breeze blowing all day. At nightfall we pushed out into the Strait and laid to until morning, when it was intended to renew the search. At daylight on the morning of the 10th, we steamed shorewards and examined part of the coast north of the Lower Savages, but a heavy snow storm setting in, with a fresh gale from the south-east, and a falling barometer, I decided to abandon Resolution Island Station for the time being, and push on towards North Bluff. The latter place was reached about 4 p.m., on Monday, the 11th, after working our way through some open stretches of ice. Here we found a good anchorage on Big Island (called by Schwatka, Turenne Island), which forms the southern side of North Bay.

A suitable place was selected for the station buildings, and the place was called Ashe's Inlet, after Mr. W. A. Ashe, the observer assigned to that station.

We found here a number of Eskimos, who seemed to be much pleased at seeing white people coming into their country.

We were delayed a good deal at Ashe's Inlet by bad weather and by the field ice coming into the harbour and interfering with the work of landing lumber and supplies, but at noon on the 16th all was in readiness for the start. I left with Mr. Ashe, for the time being, Mr. Skynner and his two men, Messrs. Rainsford and Jordan, whom I was unable to place on Resolution Island, and at 2:30 the "Neptune" was directed towards the south shore of the strait, and at 8 o'clock on the morning of the 17th we sighted the north-west shore of Prince of Wales Sound.

On approaching the land, we forced our way through about twelve miles of field-ice, more or less compact. Towards the shore the ice was more open, and much of it was aground in three and four fathoms of water. We anchored about 2 p.m. in a well-sheltered bay, about three miles along the north-west coast of the sound, from the south main shore of the strait. A few minutes later a number of Eskimos were seen on shore. They were very much delighted when they learned that we were going to establish a station among them. I named this place Stupart's Bay, after Mr. R. F. Stupart, the observer assigned to that station.

On account of the magnetic observations to be taken, two extra buildings were required at this station, but notwithstanding the extra work to be done, everything was in readiness for our departure on the evening of the 22nd.

Accordingly we left Stupart's Bay on that evening, and had to work our way through about eighteen miles of more or less compact field ice. We laid-to in the ice all night. On reaching the open water we shaped our course so as to clear the eastern point of Charles Island, after clearing which we steamed towards Nottingham Island, and succeeded in making a good harbor on the south-east shore of that island about 3 o'clock on the 24th.

On approaching Nottingham Island we found very heavy ice, extending for some fifteen or twenty miles eastward from that island and Salisbury, filling the channel between these islands and extending southward towards Cape Wolstenholme as far as we could see.

On approaching the harbour we had the misfortune to break one blade off the propeller. Fortunately a spare fan had been brought in the ship, and beyond the work entailed by unshipping the broken one, fitting the shaft in the new one and getting it into position, which occupied the engineers about three days, we suffered no damage in consequence.

Soon after our arrival at Nottingham we sighted four vessels in the channel between us and the south main shore. They were about twelve miles distant, and fast in the field ice. Later we passed near enough to one to observe that she was bark rigged, and probably the outgoing Hudson Bay Company's vessel, and to another, an American whaling schooner, to exchange salutes with her by dipping ensigns.

We met with no natives at Nottingham Island. The work of erecting station buildings and landing the supplies occupied us until the morning of the 29th, when, at 9 o'clock a.m., having taken leave of Mr. C. V. DeBoucherville, the observer appointed to that station, and his men, Messrs. Esdaile and Inglis, we left the harbour, which I had called Port DeBoucherville, and steamed out among the ice towards Mansfield Island.

We found the ice exceedingly heavy and closely packed, so much so that after ramming our way some five miles out, and while yet within sight of the harbour, we were compelled to lay to until the change of tide should loosen it. After three hours' waiting, we again went ahead with the engines, the ice having run abroad a little; but when darkness closed upon us, we were still in the ice and were compelled to lay to until the morning.

Soon after daylight on Saturday morning, the 30th, we got out of the ice into the open water of Hudson's Bay, and by 7 o'clock sighted the low, barren shores of Mansfield Island. According to the original plan, a station was to have been placed on this island, but after coasting its eastern shores without finding an anchorage, I decided, about 7 o'clock in the evening, to abandon it altogether, and push on across the bay, in the hope of being able to place a station on Cape Digges on the return voyage.

Meanwhile, however, I proposed to examine the shores of Southampton Island, which lies to the north-west of Mansfield, with a view of ascertaining if that would be a more suitable place for a station. I did this on Sunday, skirting the south-east shore from Cape Southampton, some fifty miles, without finding an anchorage.

We then directed our course towards the north-west of the bay, in order to visit Marble Island, and to see if the northern part of the bay was free of ice. At noon on the first day of September we were off the mouth of Chesterfield Inlet, no ice having been sighted.

We then bore up for Marble Island, where we arrived early in the morning of 2nd September, and anchored in the Whalers' Harbour at the south-west of the island, and remained until seven o'clock in the evening.

During the day I took observations to ascertain the latitude and longitude, the variation of the compass and the dip of the magnetic needle, and in the afternoon made a hurried survey of the harbour.

We were somewhat disappointed at not finding native or other inhabitants on the island, and surprised at seeing so many evidences of the dead, there being no less than nineteen graves on Dead Man's Island, which forms the southern side of the harbour, and a monument commemorating the death of six more who had been drowned in a whale boat, in the "Welcome."

While at Marble Island I found a letter that had been left in a bottle by Capt. Fisher, of the whaling bark "George and Mary," that had wintered in the harbour. The letter was probably intended for one of the out-going whaling vessels. I made a copy of the letter, which is as follows:—

"Aug. 7, 1884.—On board the bark "George and Mary," Marble Island. All well. Three whales. The north part of the bay has been filled with ice since the 10th of July. Could not get up the Welcome, nor to the east shore. Had a very cold winter and spring. On the 23rd of May the thermometer was 4° below zero. Got out the 7th of June. Laid in the outer harbour all winter. No natives came to the ship while we lay at Marble Island. Had plenty of scurvy, but came out of it all right. Shall stay in the Welcome until the last of August, then start for home if nothing happens.

"(Signed), E. B. FISHER,
of the 'George and Mary.' "

From Marble Island we directed our course towards Churchill, meeting with heavy weather on the voyage, and arriving off the mouth of the Churchill River on the evening of the 3rd. Owing to heavy north-west winds, fog, and to our not being acquainted with the approach to Churchill Harbour, we were compelled to lay-to off Cape Churchill until the forenoon of the 6th, when, the weather clearing, we steamed into the harbour and anchored.

At this place I received and accepted the resignation, owing to ill-health, of Mr. C. R. Tuttle, who had been appointed observer at Churchill, and arranged with Mr. Spencer, the agent of the Hudson's Bay Company stationed there, to take the required meteorological observations, engaging, on behalf of the Government, to pay him a salary of $120 per year.

We remained at Churchill, taking ballast, &c., until the 9th, when, about 7 o'clock in the evening, we started for York Factory.

I must acknowledge the extreme kindness and generous attention extended to the expedition by the officers of the Hudson's Bay Company at Churchill. They did all in their power to make our visit pleasant, and to supply me with fur clothing, &c.

We arrived in sight of the beacon at York Factory on the morning of the 11th, and anchored in the roadstead, some eighteen miles distant from the Factory, at ten o'clock in the forenoon, and signalled for a York boat, which was pushed off at once, but which, owing to contrary tide and wind, did not reach us until 5o'clock in the evening.

Mr. Cowie, chief accountant of the post, accompanied the boat out, and he kindly undertook to take us in and bring us out again the next day. We arrived at the

Factory about 3 o'clock on the morning of the 12th, and left again at 3 in the afternoon.

Mr. Wood, storekeeper at York, has been observer in connection with the meteorological office for some years. I compared his instruments and adjusted them, and found his meteorological work all well done, and the observer much interested in the work.

I obtained some additional clothing from Mr. Fortescue, the chief factor at that post, and, as at Churchill, was most hospitably received by all the officers of the company.

We reached the "Neptune" in the York boat about 5 o'clock in the evening of the 12th, and weighed anchor at 7, and shaped our course for Cape Digges.

We found a good harbour on the south-western extremity of the larger Digges Island, and anchored on the morning of the 16th. Here I decided to place a station, in charge of Mr. Laperriere, and called the place Laperriere Harbor. I regarded the place as most suitable for a companion station to that of Port DeBoucherville. The distance between the two is about forty-five miles, and, as the vast stretches of ice that we met with between Nottingham and Digges on both the outward and homeward voyages, made that channel a point of the greatest importance, I consider it as desirable that the two stations should be establised there.

On the morning of 20th September, the buildings having been completed and supplies landed, I prepared for departure. Mr. Laperriere was placed in charge of the station, with Messrs. Quigly and Maher as stationmen. I substituted Mr. Quigly, one of the carpenters, for Mr. Youill, whose condition of health rendered him unfit to be left there.

On the homeward voyage the expedition touched at Port DeBoucherville, Ashe's Inlet and Stupart's Bay, leaving such furs and other clothing as I had obtained for the comfort of the men. At Ashe's Inlet I took on board Messrs. Skynner, Rainsford and Jordan, and left with Mr. Ashe, Messrs. Keating and Drysdale, the men originally intended for that station.

From Stupart's Bay we made for Resolution Island, hoping to be able to place a station on the shores of that island. Arriving on the west coast of the island on the morning of the 26th of September, we coasted along in search of a harbour. At 9 o'clock a boat was sent in to examine a bay that promised well. The vessel followed some distance astern, going dead slow, with a look-out man on the jib-boom. Leads were going from both the boat and the ship. Presently the boat reported only four fathoms; a little distance astern we had ten fathoms from the ship. In canting the ship, there being a strong northerly breeze, and the tide setting to the southward, the vessel struck a sunken rock and remained there, grinding a little at each sea, for about nine minutes. She was, however, worked off without sustaining much serious damage. A piece of wood came to the surface, supposed to be one of the scarf pieces butting on the stem plates.

We steamed further down the coast to the south-east, when about noon another bay was discovered. The mate was again sent in, in charge of the boat, to make soundings. At length he returned and reported a good harbour. We steamed slowly in, following as nearly as possible, the boat track, the engines alternately going dead slow and stopping. The lead was going constantly, and there was a look-out in the fore-top and one on the jib-boom. At 1 o'clock while the leadsman was reporting "twelve fathoms and no bottom abreast of the main rigging, the ship suddenly struck forward and the men on the look-out shouted "go astern." The ship struck very heavily and rolled two or three times. As she rebounded her engines were reversed and she was put out to sea at once.

We coasted along to Cape Best, but as there were no signs of a harbour, and as the wind was threatening a gale, and a heavy cross sea running, and as the ship had struck twice and received considerable damage, Captain Sopp advised that the station on Resolution Island be abandoned, and I felt, under all the circumstances, bound to abandon it. We had examined over sixty miles of the coast, and altogether we had expended nearly three days steaming in search of a harbour. I therefore requested

the Captain to shape our course for Port Burwell, and in that excellent harbour, we anchored at 8 o'clock on the morning of the 27th of September.

At this place we took ballast and filled up the bunkers with coal from the hold.

On our return here, as at the other stations, we found all in good health and spirits, liking the work, and well satisfied with all that had been provided for them. The provisions, especially the evaporated fruits and vegetables were spoken of as being of an excellent quality.

We continued the homeward voyage from Port Burwell at 3 p.m., on 29th September, carrying the ebb tide with us through Grey Strait for Nachvak Bay.

At noon of the 30th we anchored in a cove on the north side of the entrance to the bay, and having selected a site for the house, proceeded at once with its erection and with the work of landing the stores.

On Saturday evening, the 4th October, the work was completed, but as it had been a week of unusually hard work for all hands, I lay in harbour till daylight on Monday morning, the 6th, when we proceeded to sea for St. Johns, Newfoundland, where we arrived on the morning of Saturday, the 11th, and having delivered the ship up to the owners, Messrs. Job Bros. & Co., I took passage for the entire party in steamship "City of Mexico," sailing that day for Halifax.

Navigation.

The ice has been supposed, hitherto, to be the most formidable barrier to the navigation of the straits, but its terror disappears, to a great extent, under investigation. The ice met with on the cruise of the "Neptune" may be divided into three classes—having distinctly separate origins. They are: icebergs from the glaciers of Fox Channel; heavy arctic field ice from the channel itself, and what may be called ordinary field ice, being that which had been formed on the shores of the bay and straits.

We met no icebergs in Hudson's Bay, nor did I hear of any being seen there. In the straits a good many were seen, principally along the north shore, where many of them were stranded in the coves, and some were met with in mid-channel. Of those seen in the eastern end of the straits, some had undoubtedly come in from Davis' Straits, passing between Resolution Island and East Bluff; but all of those met to the westward had come from Fox Channel, as observations made by Mr. Ashe, at North Bluff, show, that an iceberg coming in sight from the westward will pass out of view to the eastward in from three to four tides, showing an easterly set of upwards of ten miles a day. The icebergs seen in Hudson's Straits, in August and September, would form no greater barriers to navigation than do those met with off the Straits of Belle Isle, nor were they more numerous in Hudson's Straits than they frequently are off Belle Isle.

The ordinary field ice was met with off North Bluff and the Upper Savages, on the 11th of August. This ice, though it would have compelled an ordinary iron steamer to go dead slow, gave no trouble to the "Neptune," the mate on watch running the ship at full speed through between the pans, rarely touching one of them. Just before entering Ashe's Inlet we had to break through a heavy string, which was, however, done without in the slightest degree injuring the ship. In the harbour (Ashe Inlet) the ice came in, with the flood tide, and set so fast that the Eskimo were able to walk off to the ship, a distance of three-quarters of a mile. On the south shore our experience was much the same, but no ice was met with through which the ship could not have forced her way without damage. In the centre of the straits, to the east of North Bluff, no field ice was seen at all, and after leaving Stupart's Bay, on the outward voyage, although the vessel lay-to for the night in the ice, it was only to wait for daylight, and not because the ice was too heavy. This pack extended about eighteen miles out into the straits, and after getting over this distance we came into clear water. From this point to Charles Island, and thence to the end of Salisbury Island, long strings of ice were frequently seen, but as their direction was invariably parallel to our course, or nearly so, we coasted round them. On the homeward voyage none of this field ice was seen. The Eskimo, both at Ashe

Inlet and Stupart's Bay, informed me that there was an unusually great quantity of ice in the straits this year, and that they had never seen the ice hang to the shores so late in the season.

The Heavy Arctic Ice.—After passing the east end of Salisbury Island the ice got heavier and closer, and when off Nottingham Island the pack was so run together that I determined to give up the attempt to force the ship through it, and working out again, headed more to the southward. In making in for the land here we broke the propeller, but succeeded in taking the ship into harbour with the stumps.

Viewed from the top of a hill on Nottingham Island the sea in every direction was one vast ice field, and to the southward, between South-east Point and Cape Digges, we saw four vessels fast. This ice was altogether of a different type to what we had hitherto met with. Some of it was over 40 feet thick of solid blue ice, not field ice, which had been thickened by piling of pan on pan, but a solid sheet of ice which had evidently been frozen just as we saw it. Much of it was 20 feet thick, and for the general average of all the field we passed through coming into harbour, I estimate that the thickness would have been upwards of 15 feet. The question as to the origin of this ice and whether it will be frequently met with in the west end of the Straits is an important one; for in such ice, when closely packed, a vessel even of the build and power of the "Neptune," was perfectly helpless. I do not consider that it is possible for ice to form in Fox channel to a greater thickness than 10 feet in a single year, and I feel convinced that much of the ice which we encountered was the accumulation of several years.

The depth to which water will freeze has, so far as I know, never yet been determined, but it is certain that ice being a very poor conductor of heat, when once a certain thickness of ice has been formed, the rate of thickening will be very slow. In regard to this point, measurements of the formation of ice will be made at some of the observing stations in Hudson's Straits this year, which will assist in finally determining this question.

If, as seems probable from the reports of the Hudson's Bay ships, this year and last year have been exceptionally heavy ice years, it is reasonable to conclude that only occasionally does this heavy Fox Channel ice appear in Hudson's Straits. Another piece of confirmatory evidence as to the exceptional nature of the ice met with in the northern part of the Bay this year is the statement in Capt. Fisher's letter, found at Marble Island and quoted in the narrative portion of my report, that he had been unable to reach, up to the date of his letter, the east shore, or to go up the Welcome on account of the ice.

The harbour ice forms at Churchill on the average about the middle of November and breaks up about the middle of June. As this is the only known harbour on the west coast of the bay, these times may be taken as marking the extreme limits of the season during which it would be possible for a ship to enter and leave the harbour.

It is only fair to state, that had I been making the passage from Cape Chudleigh, direct to Churchill instead of coasting and working across the straits, I do not consider that I should have been delayed by ice, more than forty-eight hours: but no ordinary iron steamship, built as the modern freight carrier is, could have got through the heavier ice that we met without incurring serious risk, if not actual disaster.

Since the foregoing was written, I have received a copy of the Report of Lieut. Ray, United States Signal Service, to the Chief Signal Officer, on the conduct of the observations at Point Barrow in the Arctic. He gives as the greatest thickness of ice formed in one season 6 feet 2 inches. At Point Barrow the formation of ice on the shore is certainly influenced by the passage of a current of warm water passing through Behring Straits and setting north-east.

Fox Channel has no such advantage, and I still think it possible that a sheet of ice 10 feet in thickness might be formed there in one season.

The Compass.—In working through the straits, especially at the western end, I found the ordinary compass so sluggish as to be almost useless. The Sir Wm. Thomson card, however, worked admirably when properly compensated.

The reason of the difficulty with the compass is, that from the proximity to the magnetic pole the horizontal directive force of the earth's magnetism, which alone directly affects the compass needle, is very small compared with the whole magnetic force; consequently, the effect of induced magnetism in the iron of the ship on the compass becomes very large in comparison with the direct action above mentioned; the result being, that in an imperfectly compensated compass the error due to local attraction is very greatly increased.

The means of correcting this error in the Sir Wm. Thomson binnacle are perfect and easily mastered, and the system is such that the compass can, after the first voyage or two, be perfectly compensated by using certain proportions of soft iron bars and magnets, as correctors, the proportion having to be determined by actual observation and experiment on the voyage.

All steamships making the voyage through the straits should have one of these compasses as a standard, and the captains should familiarize themselves with the methods of correcting them, and as often as opportunity offers take azimuth observations, both stellar and solar.

Currents.

Off the entrance of Hudson's Strait I found the current setting to the southward, During the two days whilst lying off in fog, the wind was very light, and the drift of the ship must have been almost entirely due to the current. In the forty-eight hours lying-to, the ship was set forty miles to the south of her position by dead reckoning. This is a somewhat greater amount of southerly set than the Admiralty directions indicate, and ships approaching the entrance of the straits would, in thick weather, have to do so with great caution.

At Port Burwell, near Cape Chudleigh, the tide rises and falls, at springs, about 19 feet, and the current in Grey Strait, between the Button Islands and the cape, flows at the rate of about four knots an hour; and when a strong breeze is blowing against the tide, a very nasty and confused and breaking sea gets up, which fishing schooners might find dangerous.

At Ashe's Inlet, near North Bluff, the tide rises and falls 32 feet at springs. There is a tide-race off the Bluff, and within three miles of the shore the velocity of the tide currents is very great, sometimes reaching six knots.

At Stupart's Bay, near Prince of Wales Foreland, the rise and fall of the tide is 28 feet. The tides of this coast do not show as high velocities as on the north side, probably owing to the water being shoaler.

At the western end of the straits the tides also run with great velocity. The rise and fall at Nottingham Island, at spring tides, is 14 feet, and Cape Digges about 10 feet.

At the entrance of Port Churchill there is a tide-race, the velocity of which, at half-tide, I estimate at seven knots.

Meteorological.

The meteorological work, which is to be done at the stations, is as follows:—

Observations will be taken six times a day, of height of barometer, temperature of the air, temperature of wet bulb thermometer, velocity and direction of the wind, reading of hair hygrometer, cloudiness, with record of amount and kind of cloud, and direction of its movement, and rain and snow fall. Water temperatures will also be taken. The times of observation are at equal intervals of four hours, and so selected that three of them are synchronous with the regular telegraphic series taken by the observers of the Meteorological Service.

Complete observations were taken on board during the voyage and, for the purpose of illustrating the weather which was met with in Hudson's Straits, I shall compare it with that experienced at Belle Isle, a station of the Meteorological Service, and in the regular trade route between Quebec and Europe.

For the first period from 1st to 31st August.—The "Neptune" was, on 1st August, at Nachvak Bay, within 100 miles of the east end of the Straits and, on 30th August, had just left Nottingham Island on the west end, so that the month of August was spent in the straits region.

The following table is compiled from the Meteorological Records:—

	Belle Isle Straits.	Hudson's Straits.
Number of days on which fog is recorded	13	9
Approximate number of hours of fog	220	102
Days on which snow fell	0	4
Days on which rain fell	10	8
Days on which wind exceeded 25 miles per hour, but did not reach 40	6	5
Days on which wind exceeded 40 miles	2	1

The month of August thus shows favourably for Hudson's Straits, the fog there being reported on six days only, as against thirteen days in Belle Isle; and the total number of hours of fog being respectively 102 in Hudson's Straits, and Belle Isle, 220; and if the duration of the snow storms in Hudson's Straits, nineteen hours, be added to the number of hours of fog, it still shows favourably. The number of gales also is six at Belle Isle for five in the straits; and of heavy gales, two at Belle Isle, and only one in the straits.

The following comparison for September is between Station No. 1, at Cape Chudleigh and Belle Isle:—

	Belle Isle Straits.	Hudson's Straits.
Number of days on which fog is recorded	7	4
Approximate number of hours of fog	82	34
Days on which snow fell	3	8
Days on which rain fell	15	6
Days on which velocity of wind was between 25 and 40 miles per hour	4	5
Days on which velocity of wind was 40 miles or over per hour	11	3

Days on which any snow fell are put down as snow days, though rain as well as snow may have fallen on those days.

In the character of the weather, therefore, for the two months (August and September) so far as it affects navigation, Hudson's Straits compare favourably with the Straits of Belle Isle, there being eleven heavy gales at Belle Isle against three in Hudson's Straits, and more than double the amount of fog.

The mean temperature of the month at Cape Chudleigh for August was 39°; for Belle Isle, 49°·67; and for September, Cape Chudleigh, 32°·76; Belle Isle, 43°·1.

Reports formerly received from the Labrador Mission Stations give higher mean temperature for those months, but those stations may be considered as almost inland stations in the character of their weather, and would thus show both higher temperature in summer and lower in winter than an insular station like Belle Isle.

I have received, through the courtesy of the Chief Signal Officer of the United States Signal Service, copies of the observations taken at Fort Chimo, in Ungava Bay, by Mr. Lucien Turner, who has spent two years there, and the winter temperatures given in these will not, I think, greatly differ from those in the Straits.

These tables form Appendix B to this report.

The following table gives the weather experienced in Hudson's Bay, from the 1st to 16th September:—

Cape Digges and Marble Island.

		Mean temperature.
September	1.—Fair weather, light N.E. winds	43°
"	2.—Fine and cloudy p.m. with strong N.E. wind	42°
"	3.—Rainy weather, moderate gale from S.E.	40°

Off Churchill.

September	4.—Rainy weather, strong gale from N.W.........	40°
"	5.—Cloudy weather, strong gale from N.W........	40°
"	6.—Cloudy, light rain, light N.W. wind, thick weather...	39 5°

At Churchill.

September	7.—Fine weather, light S.W. wind....................	42°
"	8.—Fine weather, light N.W. and S.W. wind.....	44°
"	9.—Fair cloudy weather, moderate N.E. wind...	41°

York.

September	10.—Cloudy weather, light rain, mod. S.E. wind..	40°
"	11.—Fair weather, moderate N.E. wind............	41°
"	12.—Fair weather, light S. wind......................	46°

York to Digges.

September	13.—Fair weather, light N.E. wind.......	42°
"	14.—Fog in a.m., fine p m., light N.E. wind.......	35°
"	15.—Foggy weather, strong N.W. wind............	34°
"	16.—Fair weather, light N.E. wind.....................	32°

The above shows one gale lasting nearly three days, viz., the 3rd, 4th and 5th, and two days on which fog occurred. On the 14th the fog lasted from 9 a.m. to nearly 3 p.m., closing down again early on the morning of the 15th and continuing thick fog till about 3 p.m.

Sea Temperatures.

The temperature of the surface water off Belle Isle on 25th July was 41·6 which gradually decreased as we proceeded northward to 34·7 on 4th August, off the entrance to Hudson's Straits.

On the homeward voyage these temperatures were, off Hudson's Straits 32·5 on 29th September, and abreast of Belle Isle, but some distance to the eastward, 36° on 9th October.

In Hudson's Straits, the mean surface temperature, as obtained from observations taken when the ship was at sea, was, on the west-bound voyage, found to be 32.9, the highest mean of a day's observations was 33·3, and the lowest 32·6. On the homeward voyage the lowest daily mean was 31·8 and the highest 33°. The highest temperatures were in each case observed at the eastern end of the straits and the lowest off Nottingham Island.

In the bay the surface temperatures varied much with the geographical positions, being 39·4 off Marble Island, 41° off Cape Churchill, 39·7 about 100 miles north-east of York Factory, observed whilst steaming across to Cape Digges, and 36° off the south end of Mansfield Island.

Hudson's Bay may therefore be regarded as a vast basin of comparatively warm water, the effect of which must be to considerably ameliorate the winter climate to the south and east of it.

The resident factor at Churchill informs me that the bay never freezes over so far out from shore, but that clear water can be seen; and as the temperature of the water must be above 29·8 Faht. (the freezing point of salt water) when at the same time the temperature on shore is below zero, we have a set of conditions which will cause a regular area of low barometric pressure to remain over the bay during the winter, with prevailing west and north-west winds and very cold weather on the west and north west of the bay, as shown by observations at York Factory; whilst on the opposite side of the bay winds from south-west, south and south-east would prevail.

In concluding this the meteorological portion of the report, I would point out that so far as meteorological conditions are concerned, the bay has been proved navigable early in June. The barque "George and Mary" sawed out on the 7th June of this year, and was cruising under sail from that date onwards in the northern part of the bay.

Surveying Work.

At Station No. 1, Port Burwell, near Cape Chudleigh, the harbour and part of the adjacent coast was surveyed by Mr. W. A. Ashe, D.L.S., who was one of the observers appointed to the expedition, and I have prepared sailing directions for entering the port. Mr. Ashe also surveyed the harbour at Station No. 3 (Ashe Inlet). At all the other stations in the straits I have myself, besides making determinations of position, variation and dip, made surveys of the harbors, and written out the necessary sailing directions for entering the ports. I also made a hurried survey of the harbour at Marble Island, and have obtained a copy of a plan of Churchill Harbour from one of the Hudson's Bay Company's officers. Copies of all these I will furnish you with hereafter, when I have had time to complete the final reductions and recopy the plans.

Resources of the Region of Hudson's Bay and Strait.

As to the resources of these waters, I have the honor to report:

1. That the economic fish and mammals of those waters are the whale, porpoise, walrus, narwhal, seal, salmon, trout, cod, and a variety of small fish.

2. That the only fishing industries developed so far are, the whale fishery by the Americans, and the porpoise, walrus, salmon and trout fisheries by the Hudson's Bay Company.

3. That the chief whaling ground is the Rowe's Welcome, a vast basin in the north-western portion of Hudson's Bay. Here the American whalers, chiefly from Massachusetts and Connecticut have been conducting a very profitable fishery for more than a quarter of a century, and are still in active operations.

The report of the United States Commissioners of Fish and Fisheries for 1875-6 states, that during the eleven years preceding 1874, about fifty voyages were known to have been made by whaling vessels from New England to Hudson's Bay, and their returns amounted to at least $1,371,000, an average of $27,420 per voyage, which, as most of the vessels engaged in the trade are comparatively small sailing vessels, shows a large margin for profit to those engaged in the business. And if we allow an average of three vessels per annum since the date of the returns up to the present year, we have $822,600 as the value of the oil and bone taken by our neighbours from the waters of Hudson's Bay since the date of the report above quoted, making a grand total of $2,193,600.

The wintering quarters of these whalers is at Marble Island, on the north-western coast of Hudson's Bay. The whaling ships, generally, leave Massachusetts or Connecticut in July, and reach the island some time in September, where they winter in a well sheltered harbour, and saw out of the ice in June of the following spring. They then press northward as fast as the moving ice will permit, until the whaling ground is reached, where they fish until the 1st September, and then sail for home, with their ships well loaded with blubber and bone. One or two whaling vessels, and occasionally more, winter at Marble Island each year.

Although this industry is, as yet, comparatively small, I am persuaded that, from the large profits realized by those engaged in it, from the ample opportunities for its extension, and the increased attention which is now being given to the resources of the Hudson's Bay region, a much larger number of vessels will, undoubtedly, be drawn into it at an early day. I am satisfied that there are large numbers of whales in these waters, from the fact that we met with them continually during the cruise of the "Neptune," and because, so far as I can learn, those engaged in the catch have never yet been compelled to return without a fair cargo. The bark "George and Mary," Capt. Fisher, of Connecticut, wintered at the Island last season, sawed

out of the ice on the 7th of last June, and succeeded in taking three whales in the open waters of Hudson's Bay before reaching the "Welcome." Considering that five or six of these mammals would complete her cargo, it is easy to see that this fishery is by no means falling off.

4. Of the fisheries carried on by the Hudson's Bay Company, that of the porpoise is the most extensive. The blubber of these mammals weighs from 250 to 400 pounds, and is very rich in the finest of oil.

Last year the company secured nearly 200 in one tide at Churchill, and a much larger number at Ungava Bay. They have established extensive refineries at several of their northern stations, and instead of exporting the blubber in bulk, as formerly, refine it, shipping the pure oil in casks. The porpoises are not shot or harpooned, as is the case with the walrus and whale, but are grounded on the flats in coves, where the tide rises 10 or 15 feet or more, and where, by means of trap nets, they are held in check until the water recedes, leaving them high and dry on the boulders and sand. The process is very simple and inexpensive. The company also carry on a walrus hunt, sending two sloops annually from Churchill to two very productive walrus grounds, north of Marble Island, where they have never failed to secure as much blubber, ivory and hides as their little vessels will carry in a few weeks. They took between twenty and thirty of those animals the present season. On this trip they also meet the northern Eskimo, and carry on a very valuable trade with them, exchanging powder, shot, &c., for ivory, oil, musk ox robes, and other furs.

One of the members of the expedition was furnished with an estimate of the value of the oil secured in the Hudson's Bay region last year by the company and the American whalers, which, although I had no means of verifying it, is probably within the mark. It places the value of the export at $150,000. I am satisfied that the walrus and porpoise fisheries may be developed to almost any extent; and as increased attention is sure now to be given to this industry, we may rely upon its almost immediate extension. We met with walrus in great numbers at the western end of the strait. In one afternoon, while steaming from the Digges Islands to Nottingham Island, we found between fifty and a hundred of them on the ice.

5. The company is also engaged at several points, particularly at Ungava, in the salmon and trout fisheries. These excellent fish abound in vast quantities in nearly all the streams, and are generally most plentiful at certain seasons just above and near the head of tide, where the salt and fresh waters mingle. From what I could learn of this industry, I conclude that it is but the beginning of what will, in the near future, become an extensive and profitable business.

At the present time the Hudson's Bay Company have a steamer, called the "Diana," which goes from London to Ungava Bay direct. She is fitted out with refrigerating apparatus, by means of which they are enabled to send home the salmon fresh to the London market, where it realizes high prices, and has, I understand, proved a profitable business for the company. Cargo this year is reported to have realized $18,000. This is the sole business that this little steamer is engaged in, as another steamer, called the "Labrador," carries all the freight required for Fort Chimo and the Ungava district.

6. Cod-fish. Up to the present time cod have never been found in the waters of Hudson's Bay or the western portion of the strait, but they are very plentiful in the bays round Cape Chudleigh, on both the east and west side. Newfoundland schooners, even now, work as far north as Nachvak Bay, and seem, year by year, to have been going further north.

The quality of cod found off Cape Chudleigh, though good, was not of the same high quality as that got on the banks.

7. In conclusion, I have the honour to urge that in any negotiations with the Government of the United States, relative to a treaty of reciprocal trade, due allowance should be made for the great value of the fisheries of Hudson's Bay.

If American whalers are to be permitted to continue to fish in those waters, arrangements should be made by which Canada would receive a substantial equivalent for the privilege.

I would further suggest that unless a very large consideration is granted in return for the privilege, the Canadian Government should reserve the right to make and enforce such regulations as will prevent the extermination of these valuable mammals from our northern waters. In support of this suggestion, I would call your attention to the fact that some years ago whale fishing was a thriving industry in the Gulf of St. Lawrence, some ten schooners being at one time engaged in it, but that shortly after the Americans were granted the right to fish in these waters, they had, by use of explosive bombs and other methods of capturing these animals, completely driven them out of the gulf, and the Canadian whaling business was destroyed.

Trade.

The trading station for the south side of Hudson's Straits is Fort Chimo, at the south end of Ungava Bay, and the Eskimo and Indians visit the fort regularly, to exchange their furs for powder, shot, &c.

At Nachvak Bay also, the company maintain a post, where a number of the most valuable furs, the black fox, &c., have been obtained from the natives.

The Nachvak station is one of the company's chain of posts on the Labrador coast, subsidiary to Rigoulette. These posts obtain their supplies by the steamer "Labrador," and I have been informed that the Newfoundland authorities claim and collect Customs duties on the whole ship's invoice at Rigoulette, thus collecting there duties on goods which are destined for consumption in Canada, inasmuch as all the goods for Fort Chimo are included. Canada is thus the loser, whilst the company derives no benefit, except what may arise from the difference of the tariffs of the two countries.

The exports from these and the Mission stations are principally, seal skins and oil, salted salmon and trout, codfish, ivory, bear, deer and fox skins. From Ungava, besides fur, porpoise oil is exported, and frozen salmon, as stated previously.

The Hudson's Bay Company, in trading, have to pay duties, and a considerable sum accrues to the Canadian Government in Customs dues on the importations to Churchill, York and Moose. Every American whaler, however, which enters the bay, is an unlicensed trader, carrying in American goods and trading with the natives in the north-west of the bay, where they compete with the Hudson's Bay Company, who have to pay duty on their importations.

A regular trading post has also been established by a Capt. Spicer, an American citizen, on the north shore of the straits, a little to the west of North Bluff, which I intended visiting, but was unable to do so.

I was, however, informed by the natives, that each year a ship went to the station, that an agent lived there through the winter, and that about fifty families traded with him. The Eskimo at North Bluff had an old whale boat of American build, but in good repair, and they informed me that they occasionally killed whales for Capt. Spicer, and that whenever they secured a whale that they were given spirits. The evil effects of such payment are too well known to need comment.

In reference to the value of the trade, I have heard it estimated, by men whom I considered competent judges, that a good Eskimo family would be worth $500 a year to a trader. The Hudson's Bay Company rate some of their best Indian hunters as worth $1,000 a year to the company, and, allowing that the straits region is a somewhat poorer region than the north-west of the bay, a family ought still to be worth nearly $400 to a trader. This estimate gives the value of Capt. Spicer's station at $20,000 a year, an estimate which I believe to be rather below than above the truth. All goods, destined for trade with the natives, on board of the American whalers, should be chargeable with duty, or a license fee charged them, before they are permitted to enter Hudson's Straits, which would be sufficient to cover the duty, so that they may be placed on the same footing as the Hudson's Bay Company; for the value of the trade in musk ox robes, cariboo robes, seal skins and ivory, forms no unimportant part of the profit of the whaling voyage.

The use of ardent spirits as an article of trade, or indeed its importation, should be absolutely prohibited.

There is room for the profitable establishment of trading posts on the south shore of the bay, as the natives there have to go upwards of 300 miles, toFort Chimo, for powder, shot, &c.

I was also informed by the natives at North Bluff, that about the Middle Savage Islands we would find natives who had never traded with white men, and who had large quantities of ivory.

That a profitable business can be carried on in pursuit of whale and porpoise fishery and walrus hunting, together with the trade with the Eskimo, seems beyond doubt, and it is unfortunate that none of the profits derived from it are at present received by Canadians.

NATURAL HISTORY.

The Inhabitants.

With the exception of people who may be in charge of Capt. Spicers' station, the only inhabitants of the straits and northern part of the bay are the Eskimo.

On the north side of the Straits they are quite familiar with the ways of white men, and seem to be much pleased at the prospects of increased intercourse with them. Some one or two of them speak English, whilst some others understand easily what is said to them, but refuse to speak it. They are particularly fond of any article of clothing, either cotton or woolen, and the head man at North Bluff was arrayed in all the glory of a stand-up linen collar.

These natives are docile, amiable and willing to work. When landing the stores and coal at North Bluff they worked all day along with our men, carrying heavy weights up over the rocks, and working as cheerily and heartily as could be desired, taking their pay in biscuit, of which they are inordinately fond.

The number met with at the station here was about thirty, but during my absence a large number of them visited the station, maintaining the most friendly relations with our party.

They have no farinaceous food of any kind, and, as a consequence, the mothers suckle the children till they are from three to four years of age. The families are small, there rarely being more than two or three children, and although early marriages are the rule among them, I cannot help thinking that their numbers have sensibly diminished, inasmuch as we found signs of their presence everywhere; yet, except at Port Burwell, Ashe Inlet and Stupart's Bay, none were met with. About six miles south of Port Burwell there is the remains of what must once have been a large Eskimo settlement, their subterranean dwellings being still in a fair state of preservation. At the present time, so far as I can learn, there are only some five or six Eskimo families between Cape Chudleigh and Nachvak.

Along the Labrador coast the Eskimo gather in small settlements round the Moravian Mission stations. At these places their numbers vary considerably. Nain is reputed to be the largest settlement and its Eskimo population amounts to about 200 souls.

These are all educated. They can read and write in their own language and the missionaries informed me that they were regular attendants at church and are very fond of music. No alcoholic or other liquors are given to the natives by these missionary traders; but they occasionally procure small quantities from Newfoundland fishermen. It is, however, a rare occurence, and there is no record of any disturbance or trouble ever having been caused.

These missions are self-supporting, the missionaries supplying the Eskimo on loan with the very best traps, fishing lines etc., and puchasing from them all their produce, whether it be seals, cod, salmon, furs or anything else. They are supplied by a sailing vessel called the "Harmony," which sails from London each year, visits all their Mission stations and then returns, taking with her the great portion of the season's catch. The Newfoundland mail steamer makes several trips to Nain during the summer of each year, but does not go any further north.

I have mentioned these missionary traders and their work, because I am of opinion that the system, when honourably carried out, as it has been and is on the Labrador Coast, is the one which best meets the wants of the natives and tends to the improvement of their condition.

In speaking of the inhabitants of the straits, I mentioned more particularly those living on the northern side, but those met with at Stupart's Bay were equally tractable and ready to assist in the work. They were, however, from less frequently meeting with white people more simple, but decidely more demonstrative; their delight on being informed that we were going to build a station and leave a party among them was exhibited by their forming a circle round the interpreter and dancing and shouting like a lot of school children.

One word must be said in regard to their honesty. Although scraps of iron and wood possess a value to them which we can hardly appreciate, they would take nothing without first asking permission; not even a chip or a broken nail was taken without their first coming to the officer who was on duty at the building for permission to take it.

As to the pernicious effects of their contact with American whalers, I beg to quote from the report of Lieut. Ray, of the United States Signal Service, who was in charge of the Observatory at Point Barrow, premising that I have every reason to believe that the New England whalers carry on very much the same sort of trade that their brethren of the Pacific seem to have done. Lieut. Ray says:—

"The safety of the station would be very much increased if the law relating to the sale of contraband goods by the whale men and traders on this coast could be enforced." * * * * * "I believe the offenders in the fleet this year are confined to two or three ships. I met nearly all the captains when they first came up, and they promised a strict compliance with the law, but in spite of all that, the natives here have been drunk three different times during the last month."

Fauna.

The terrestrial mammalia of Hudson's Straits and northern part of the bay are:

The polar bear, the fox (three varieties), the hare, the reindeer.

The skin of the polar bear is valuable, being held at $12 by the agents of the Hudson's Bay Company. These animals, though reported by the Eskimo to be very savage, will not, I think, as a rule, attack a man unless first wounded or emboldened by hunger, when I can well understand that they would be dangerous to encounter. They prey chiefly on the seal. The Eskimo on the south side of the straits, at Stupart's Bay, informed me that at certain times of the year there were large numbers of them in that vicinity. The meat of these bears is not unpalatable, but the liver is said to be poisonous.

The Fox.—Judging from the number of white fox skins which the natives had, these animals must be very numerous. These skins, however, have no high commercial value, and are, indeed, almost valueless, unless captured at a certain season of the year.

The blue fox is a sort of a steel grey colour. Their skins are more valuable than those of the white fox, but they are much less numerous.

The red fox is valuable as indicating the probability of the presence of the black fox, whose fur is so very valuable. The red fox was seen on the south side of the strait, and black foxes are annually shot or trapped in the country south of Cape Chudleigh.

The reindeer are the food and clothing of the Eskimo, and their horns are used for making the spring bows of their fish spears and for many other purposes. We procured some of the venison from the Eskimo at North Bluff, which was pronounced by every one to be excellent.

The hare is a common animal over the whole coast of the straits, being especially numerous about North Bluff.

Game Birds.—Many kinds were seen. Geese, swans, duck and ptarmigan were plentiful, so that the officers and men at the station can easily procure a palatable change of diet.

The Work of the Expedition in the Coming Year.

Much will undoubtedly be learned from the observations taken during this winter as to the formation and breaking up of the ice and generally in regard to its movement, and also of the phenomena affecting navigation, but it would be impossible to state definitively from one year's observations what was the average period of navigability of the straits. I consider, therefore, that it would be desirable to continue certain of the stations for a second year, and might perhaps be desirable to keep on three of them for a third year.

For the year 1885-86, I have the honour to recommend that the following stations, Port Burwell, near Cape Chudleigh, Ashe Inlet, near North Bluff, Stuparts' Bay, near Prince of Wales Foreland, Nottingham Island and Digges Island, be continued.

The station at Nachvak Bay could easily be disposed of, as the Newfoundland fishermen already visit the place for the cod fishing, and if it were advertised in the St. Johns, Nfld., papers, I do not doubt that the Department would get offers for the purchase of the house.

The expedition for next year should be ready to start from Halifax about the 15th of May—not later than this date—and arriving off Hudson's Straits about the 1st of June, if possible visit and relieve the stations. Should the ice prevent our getting on shore, the ship should push on so as to investigate once for all the condition of the ice in the straits and bay in the early part of the season. If successful in getting through the straits, the voyage should be continued to Fort Churchill, the endeavour being made to arrive there about the opening of navigation, the 15th of June.

After leaving Churchill the eastern shores of the bay should be visited, and a running survey made of such portions of the coast as practicable. Beacons should be erected on the north end of Mansfield Island and the south end of Southampton Island. Both these islands are low-lying, with shoal water running for some distance out; they are of a dark grey limestone formation and most difficult to make out at night, the mariner's only safety being in the constant use of the lead. Especially are they dangerous on account of the tides, which run along the east coast of Mansfield Island at the rate of about four knots per hour.

This work could, I think, be accomplished and the ship be back in the straits by the 15th August. The remainder of the time should be devoted to making a running survey of such part of the coast of the straits as may be possible. Capt. Spicers' station should be called at, and if time permitted, the Hudson's Bay post at Ungava should also be visited, the expedition returning to Canada in October.

If, however, the Government regard it as more important to investigate the fisheries of the bay and straits, the ship should push up north for Marble Island as soon as possible, thence to "The Rowe's Welcome." After spending a short time in "The Welcome," the porpoise fishery at Churchill should be examined.

After leaving Churchill, under any circumstances, the east shore should be visited, and its mineral and other resources examined and reported on.

The vessel should also be fitted with a deep-sea dredging apparatus, wire dredge rope and deep-sea sounding apparatus.

In the event of your deciding on sending out the expedition in May, it would be advisable to send to Ashe Inlet a schooner load of coal. If this vessel were to start so as to be in Ashe Inlet about 20th August, she would have but little difficulty from the ice. The harbour is an easy one to make, with no outlying shoals or rocks; inside it is well sheltered and good holding ground.

I have endeavoured in the foregoing pages to give all the information in my power in regard, not only to the navigation, but to the resources of the region of Hudson's Bay and Straits, and I trust that my efforts will meet with your approval.

All of which is respectfully submitted.

ANDREW R. GORDON,
Commanding Hudson's Bay Expedition.

APPENDIX A.

GEOLOGICAL AND NATURAL HISTORY SURVEY,
MUSEUM AND OFFICE, SUSSEX ST.,
OTTAWA, 19th January, 1885,

The Honorable A. W. McLELAN,
Minister of Marine and Fisheries,
Ottawa.

SIR,—In compliance with instructions received from the Hon. Sir David Macpherson, Minister of the Interior, I have the honor to transmit to you, as received by me on the 14th inst., the accompanying copy of the report, by Dr. Bell, of observations made on the shores of Labrador, Hudson Strait and Bay during the voyage of the steamship "Neptune," from the 22nd July to the 11th of November, 1884.

The botanical and marine zoological collections made during the voyage have been examined. The plants have been named by Professor Macoun, the crustaceans by Professor S. J. Smith, of Yale College, and the molluscs and echinoderms by Mr. J. F. Whiteaves. The plants are represented by 118 genera and 227 species. The crustacea by 13 genera and 16 species. The molluscs by 19 genera and 25 species, and the echinoderms by 5 genera and 6 species. The brachiopods, cirripeds or barnacles and the annelids each by 1 species.

Of the plants Professor Macoun states as follows:—

"The collection is a very interesting one and shows conclusively the Arctic character of the climate of the Straits and that part of Labrador north of Nachvak. North of Nain, all the plants obtained are exclusively Arctic, not one of them, except the Arctic Raspberry (*rubus chamæmorus*) and a couple of species of Vacinium ranging as far south as the Gulf of St. Lawrence. The greater number, however, are widely distributed on the shores of the Arctic Sea, and are the characteristic plants of both Arctic Europe and America."

Mr. Whiteaves states that the marine invertebrata are well known Arctic species, most of which are common to the St. Lawrence Gulf, their range there being from about ten fathoms to fifty, where they form a large part of the food of the codfish—especial thanks are due to Professor Smith, of Yale, for the list of the crustacea.

I have the honor to be, Sir,
Your obedient servant,
ALFRED R. C. SELWYN.

OTTAWA, 24th November, 1884.

A. R. C. SELWYN, Esq., LL. D., F. R. S.

SIR,—Herewith I beg to submit my report as geologist and naturalist on the Hudson's Bay Expedition, sent out by the Government of Canada during the present season.

I have the honor to be, Sir,
Your obedient servant,
(Signed) ROBERT BELL.

Observations on the Geology, Mineralogy, Zoology, and Botany of the Labrador Coast, Hudson's Strait and Bay.

By Robert Bell, M.D., LL.D., B.A.Sc., F.R.S., Canada, Assistant Director of the Geological Survey.

Medical Officer to the Expedition.

The question of sending a party by sea into Hudson's Bay, for scientific purposes, at the expense of the Government, has been before the public of Canada for some years. Without entering into the subject of the various useful purposes which it was believed such a party might accomplish, it may be stated that the main object of the expedition, sent out by steamship the present season, was to establish six observatory stations on the shores of Hudson's Strait. The parties to be left in charge of these stations were to remain one year and to keep regular meteorological records, and to note all seasonal events, especially with regard to the condition of the Strait itself in winter, the tidal phenomena, &c., all with a view to throw additional light on questions regarding the navigation of these waters. If time permitted, after having built the stations, the vessel was to visit certain parts of Hudson's Bay. Without interfering with the above mentioned objects, the expedition would afford an opportunity for obtaining much desirable information in regard to the geology and mineralogy and the zoology and botany of the places which might be visited. The writer, who had been on Hudson's Bay in previous years, and who had already passed through the Strait (see Report of the Geological Survey for 1880), was selected for this duty, and also to act as medical officer to the expedition. I also acted as taxidermist and photographer for geological purposes, and provided myself with the instruments necessary for various methods of surveying, in case opportunities for using them should occur.

The expedition was essentially a meteorological one, and Lieut. A. R. Gordon, R.N., of this branch of the public service, was selected for the command; and the general management fell within the province of the Department of Marine. Notwithstanding that I had neither men nor boat at my command, I managed, while the stations were being built, or while the ship was taking in ballast, to get ashore with the boats that were passing backward and forward between the vessel and the land, and in some cases I had the use of a boat and the assistance of officers and men, both of the expedition and of the ship's company.

The following letter from the Deputy Minister of Marine, in reply to one from Dr. Selwyn, will best explain my position with regard to the facilities to be expected:

"Department of Marine and Fisheries,

"Ottawa, 20th June, 1884.

"Sir,—I have to acknowledge receipt of your letter of the 18th instant, making certain enquiries in regard to the Hudson's Bay Expedition and the employment of Dr. Bell, and in reply I am to inform you that the vessel will sail from Halifax about the 21st of next month. Nothing beyond board and berth accommodation can be given Dr. Bell, the vessel being chartered to the Department, and no special accommodation being guaranteed, but space will doubtless be provided sufficient for the storage of any specimens, &c., which Dr. Bell may collect or the stores provided for the preservation of the same. With reference to your enquiry as to what assistance, as regards men and boats, can be provided for Dr. Bell's work, I have to inform you that Dr. Bell will have the opportunity of landing at every place at which the vessel

ship over to her owners, four days before the date fixed for the expiration of the charter. On the morning of our arrival at St. Johns, we happened to catch a steamer for Halifax, and so were enabled to continue our homeward journey without an hour's delay.

Before proceeding to give details of my special work, I may say that at every place we visited I obtained as full notes as my opportunities would permit in regard to the geology and mineralogy of the surrounding country. I also endeavored to obtain from the natives information as to the occurrence of useful minerals, which, although not very definite, may in some cases lead to valuable discoveries. The Eskimo are intelligent and good observers, especially of such matters as affect their own mode of living and although rocks and minerals would not be expected to interest them much, still I found that in some instances they had taken notice of them. In order to facilitate enquiries I had provided myself with a collection of all the ores, minerals and rocks which might be expected to occur in the regions we were to visit, and on allowing the natives to inspect them, they would point out those which they thought similar to certain kinds which they had noticed in their own districts. An interesting feature in the geological phenomena of these northern regions, is that a study of them will assist us in the elucidation of the surperficial geology of the more southern portions of the Dominion, which forms so important a branch of the work of the Geological Survey.

In regard to zoology, efforts were constantly made to collect specimens in every class of animals and to obtain new information on all points with reference to them. Upwards of fifty specimens of mammals and birds were obtained, of which a portion were from Dr. Matthews, of York Factory. Some of these are rare and will prove to be very useful and interesting additions to our museum. Many notes were made on the habits and distribution of the mammals and birds. Attention was paid to the fishes and their food and to the subject of possible fisheries in these regions. A variety of mollusks and other invertebrates was secured by dredging. As we were living mostly on shipboard and in so cool a climate, but little could be done for the science of entomology. A small collection of butterflies and moths from the shores of Hudson's Strait have been sent to Mr. H. H. Lyman, a well known entomologist in Montreal, who has agreed to identify them. One of the missionaries on the Labrador coast has kindly promised to collect the Lepidoptera of that region and send them to me next year.

With regard to botany, as complete a collection of plants as possible was made at every place we touched at. These are in the hands of Professor Macoun and a catalogue of them will be found in the Geological Survey Report. Some new facts of interest in regard to the ranges of forest-trees in the Labrador peninsula and the country west of Hudson's Bay were ascertained from persons acquainted with these regions.

In addition to the technical assistance already acknowledged above, I take this opportunity of mentioning that Professor C. Hart Merriam has kindly aided me in making out from my descriptions, the local names, &c., with which he is familiar, the accompanying list of the seals of Hudson's Bay and Strait. I may mention that Professor Merriam, who is justly regarded as a high authority on the Pinnapedia, has himself gone to the Newfoundland and Labrador seal fishery, and travelled in the Gulf of St. Lawrence for the express purpose of studying these animals. It would appear from my observations that we have in both Hudson's Bay and Strait all the kinds of seals found at any season either in the Gulf or on the coast of Newfoundland and Labrador; and from all that we could learn, both seals and walruses are abundant in the Strait and the northern parts of the Bay. But in order to obtain them in large numbers for commercial purposes, their various resorts and the course of their migrations at different seasons of the year would require to be studied. The gentlemen in charge of the observatory stations were instructed to attend to such matters, and their notes will probably throw some light on the subject in the particular localities at which they are stationed. In the list of fishes, I have included species which I had in previous years ascertained to exist in Hudson's Bay or the waters immediately connected with it. Mr. Lucien M. Turner, who has spent two

years in the Ungava district in the interest of the Smithsonian Institution, has kindly determined some of the fishes which I collected, and added the names of others which he found in the district named.

I secured about sixty-five photographs of a uniform size of 8 by 5 inches. These are illustrative of subjects of interest in connection with the expedition, of the nature of the country and more especially of points bearing on its geology.

I shall confine myself in the following pages to the subjects above referred to, as all others connected with the work of the expedition will probably be fully reported on by Lieut. Gordon. In regard to the arrangement to be adopted in this report, it has been considered best to state the facts and observations in the order in which they were noted, and in connection with them to give other information, bearing on the subjects referred to, which may have been gathered in previous years.

As already mentioned, we anchored for an hour at Blanc Sablon on the morning of the 26th of July. Here the horizontal strata of the Quebec group form a conspicuous feature in the landscape. They are described at pages 287 and 288 of the *Geology of Canada* as consisting of 231 feet of red and grey sandstones and fine conglomerates forming the lower part of the section, with 143 feet of grey, redish and greenish limestones resting upon them. In Forteau Bay, a short distance east of Blanc Sablon, a considerable collection of fossils was made in these limestones by the late Mr. James Richardson, which proves them to belong to the Quebec group, and to be equivalent to the Red Sand-rock of Vermont. The Laurentian gneiss may be seen cropping out from beneath these sandstones at and near the sea shore, while the hills of the same formation rise above the level of the summit of the horizontal strata all along in the interior.

At the entrance to Chateau Bay on the Labrador side of the Straits of Belle Isle, opposite to the northern extremity of Newfoundland, are two islands, called Castle and Henley's Islands, which are capped by flat basaltic summits, the former being 200 feet above the sea. They form a striking contrast to the prevailing character of the shore rocks, which everywhere else in the neighborhood appear to be of Laurentian gneiss. Later in the season I was informed that some men had been mining mica on the shore of this bay, and in the autumn had brought about one ton of the mineral to St. Johns, on the way to Boston or New York, but that the plates did not exceed three by six inches in size, and that they were of a rather dark color.

After passing the Straits of Belle Isle, the Labrador coast continues high and rugged, and although there are some interruptions to the general rule, the elevation of the land near the coast may be said to increase gradually in going northward, until within seventy statute miles of Cape Chudleigh, where it has attained a height of about 6,000 feet above the sea. Beyond this, it again diminishes to this cape, where it is 1,500 feet. From what I have seen of the Labrador, and from what I have been able to learn through published accounts, Hudson's Bay Company's officers and the natives, and also judging from the indications afforded by the courses of the rivers and streams, the highest land of the peninsula lies near the coast all along, constituting, in fact, a regular range of mountains, parallel to the Atlantic seaboard. In a general way, this range becomes progressively narrower from Hamilton Inlet to Cape Chudleigh.

The distance from the Straits of Belle Isle to Cape Chudleigh, along the Labrador coast, is 760 English statute miles. This is divided into three principal courses, as follows: From Belle Isle to Porcupine Bay, due north (true), 120 miles; from Porcupine Bay to Nain, north-west (true), 290 miles; from Nain to Cape Chudleigh, north north-west (true), 350 miles. The coast-line is everywhere indented by inlets or fjords, and fringed with islands of all sizes, from mere rocks up to some measuring twenty-five miles in length. Most of the fjords are narrow and about twenty-five miles long; several are thirty-five miles, and Hamilton Inlet runs in from the open sea a distance of 160 miles. The general bearing of the fjords is at right angles to the coast line in the neighborhood. In a great many cases the islands are separated from one another, or from points on the mainland, by very narrow straits, with deep water, which have received the name of "tickles." With regard to the condition

below the level of the sea, it is stated in the *Newfoundland Pilot*, published by the Admiralty, that the shores from Davis' Inlet to Nachvak are comparatively free from reefs and sunken rocks, but that from Nachvak to Cape Chudleigh they are fringed with islets and rocks, to an average distance of five miles out. The coast of Resolution Island seems to be similarly studded with these impediments to navigation, and these circumstances appear to be connected with certain geological condi- tiions, which will be referred to further on.

In approaching Ford's Harbor, which is on the eastern point of Paul's Island, the islands near which we passed consisted of bare rock, and although usually high and steep, they had rounded or glaciated outlines. Numerous perched boulders lay about, either singly or in groups or rows, on the naked surface of the rock, wherever they could find a resting place. A short distance off the entrance of the harbor, we passed an island which, on the top and one side was literally piled with rounded boulders' On this island I noticed a dyke of trap about 100 feet thick, cutting the gneiss in a west-north-westerly direction. On going ashore at Ford's Harbor, I found the gneiss to consist of common reddish and greyish varieties, some parts of it massive and others more finely and distinctly laminated. The average strike was south-east (true). The glacial striæ were quite distinct in many parts, but were best preserved near the shore. They run in two principal directions, S. 45° E., and S. 80° E. (mag.) Perched boulders were observed on all the surrounding hills. In going from Ford's Harbor to Nain we followed the channel on the north side of Paul's Island. The rock appeared to be dark, massive and crystalline.

Our stay at Nain was so short that I had only time to examine the high ridge or mountain to the north and north-west of the Mission Station. The first shoulder of this ridge, we were informed, has a height of 875 feet above the sea, but the summit, a short distance further inland, must be at least 200 feet higher. The rock here consists of a rather light grey gneiss, which strikes S. 45° E. (mag.) The glacial striæ, which were seen with greater or less distinctness, all the way to the summit, run S. 65° E. (mag.) or about parallel to the valley which extends inland from the head of the fjord up which we had sailed to Nain, and with the same general bearing. Well rounded boulders were scattered over the flanks and summit of this high ridge; and they were quite prominent on the high bare hills on both sides of the inlet, all the way from Ford's Harbor. The appearance of the top of this mountain, with the boulders resting on the bare, sloping rock, is shown in one of the photographs taken at this spot. Mountains of equal and greater height were seen in all directions from this summit, except towards the eastward, where they die down to the sea level in the distance. On the next hill to the north-west, the weathered surface of the rock showed a rusty belt of a brownish color, and of considerable extent, which was supposed to be due to iron pyrites. I was informed by the Moravian missionaries at Nain that the labradorite of this part of the coast is to be found at different places on Paul's Island, and at a fresh-water lake called Nunaingok, which lies at no great distance inland from the head of a bay to the north-westward of Nain. They said it was also reported to occur on a bay a short distance to the southward. I had not an opportunity of visiting any of these localities, but from specimens which I have seen, I have little doubt the mineral occurs as veinstones, in which there are also crystals of pyroxene, iron pyrites and magnetic iron. In this connection it may be mentioned that I have seen a large specimen of coarsely cyrstalline labradorite rock from Hamilton Inlet, in which some of the faces showed a blue iridescence. The rose-red variety of anorthosite, called latrobite by Gmelin, is stated to come from an island called Amitok, on the old charts of the Labrador coast, about forty-five miles northward from Nachvak. When at Nain I obtained specimens of amazon-stone, which the Eskimo told me came from Port Manvers, and of paulite, a variety of pyroxene or hypersthene, which has also been called "Labrador hornblende" and "metalloidal diallage." It was said to have been brought from Paul's Island. Mr. John Ford informed me that yellow mica, in flakes about the size of one's hand, was found on this island, about two miles north-westward of Ford's Harbor. In regard to the rocks and minerals of the Labrador coast, the fol-

lowing notes may be here given: I have received specimens of copper pyrites in a dark slate, which were labelled as having come from Indian Island, on the north side of the entrance of Hamilton Inlet, and I have been otherwise informed that slates or schists occur in that neighborhood. A man from Nova Scotia stated to me that he had been engaged, with others, two years ago in mining copper and lead ores on Deadman's Island, which is situated a few miles north of Hamilton Inlet. They occurred in a vein between a rock like granite and a sort of sandstone or quartzite. Mr. King, the second mate of the "Neptune," said that copper ore was also found at Iron-bound Island or "Makoubik" (probably Makkovik of the chart), not far from Cape Harrison. One of the gentlemen we met at Nain informed me that he had heard of copper ore being found somewhere to the southward of that place, but was not aware of the locality. These circumstances point to the possible occurrence of deposits of copper in quantities of economic value on this coast. It is well known that productive mines of copper were in operation for a number of years on the adjacent coast of Newfoundland.

At Nain I noticed some freshly split slabs of a grey felsitic slate, which where being used as flag stones, and, on inquiring, was informed that they had been brought from Ramah, in the bay next south of Nachvak, where there was said to be plenty of this rock in situ. The name of the bay is Nullataktok, or Slate Bay. Our Eskimo interpreter, Lane, who was well acquainted with this bay, afterwards informed me that slaty rocks were abundant there.

While at Ford's Harbor and Nain I collected as many plants as the limited time would permit, and Professor Macoun's list of them will be found in the appendix. The Rev. Dr. S. Weiz, who had long resided at Nain, had made a collection of the plants of the vicinity, which he had submitted to some of the leading botanists of Europe, who had attached the proper name to each specimen. He kindly allowed me to make a list of these and it is also given in the appendix, in one of the columns of the general list.

Although timber disappeared from the outer coast before reaching Nain, yet groves of trees may be seen in the valleys and on the more favorable slopes at the heads of the inlets, and we were informed that after going ten to twenty miles inland from Nain, or from the coast for a considerable distance north of it, the whole country may be said to be wooded, as far as the condition of the surface will permit of the growth of trees, and that in favorable situations the spruce and tamarac attain a sufficient size to be sawn into lumber. At Nain, the trees consist of spruce, tamarac, and small willows, but at no great distance inland, balsam fir, poplar, white birch and rowan begin to make their appearances.

In the gardens at Nain I observed the following vegetables: potatoes (a variety with low, flat, spreading tops), turnips, carrots, beets, cabbage, Scotch kail, a very rank variety of spinach, lettuce, peas, beans and onions. There was also a great variety of flowers. The peas and beans were arranged so that they could be protected by glass if requisite, and the potatoes were planted in narrow beds, arched over with bent rods so that long sheets of coarse canvas could be thrown over them on frosty nights.

Leaving Nain, our next stopping place was the Inlet of Nachvak, about 140 miles south of Cape Chudleigh. This inlet or fjord, with an average breadth of from a mile to two miles, runs in from the open sea a distance of about forty statute miles. The water in it is very deep, and the mountains on either side immediately overlooking it rise to heights of from 1,500 to 3,400 feet, but a few miles inland, especially on the south side, they appear to attain an altitude of 5,000 to 6,000 feet, which would correspond with the height of The Four Peaks, near the outer coast-line, about midway between Nachvak and Cape Chudleigh. The mountains around Nachvak are steep, rough sided, peaked and serrated, and have no appearance of having been glaciated, excepting close to the sea-level. The rocks are softened, eroded and deeply decayed. On precipices and steep slopes the stratification is well brought out by the weathering, so that the dips may be distinctly seen. The mountains on the north side proved to be mostly Laurentian

gneiss, notwithstanding their extraordinary appearance, so different from the smooth, solid and more or less rounded outlines of the hills composed of these rocks in most other parts of the Dominion. On the present occasion we stopped only at the Hudson's Bay Company's post, at a narrow part of the fjord, about twenty miles in from the open sea, and I had a few hours to examine the rocks, collect plants and take photographs in the neighbourhood. But in returning, in the month of October, we stayed for several days at a bight on the north side, a few miles from the entrance, where we built a station, and named the place Skynner's Cove. This enabled me to extend my explorations of the neighbourhood, and I shall now state the results of my observations on both occasions.

On the south side of the inlet at the Hudson's Bay Company's post, an escarpment rises to a height of 3,400 feet, as ascertained by Commander J. G. Bolton, R. N., but I had not time to visit it to determine the nature of the rock. A brook, which gathers its waters from higher ground further back, but which is not visible from the post, precipitates itself from the top of this great precipice in an almost perpendicular fall. The rock on the north side at this place consists of reddish gneiss, somewhat contorted and occasionally interstratified with dark micaceous layers. Two or three miles east of the post a good sized brook falls, in several almost perpendicular leaps, a height of 300 or 400 feet over these rocks. The strike of the gneiss in the neighborhood of the falls is S. 35° W. (true.)

At a point on the north side, estimated to be about nine miles from the open sea and eleven from the post, opposite to a bay on the south side, a mountain rises steeply to a height of 1,500 or 2,000 feet. It is composed of gneiss standing vertically and striking N. 25° W. (true), cut diagonally by a great many dykes of dark trap all underlying westward at an average angle of about 30° from the perpendicular. Some of them run together and others appear to die out in both directions on the cliff section. Some dykes of close-grained, almost black diorite, also cut the gneiss in the vicinity of Skynner's Cove. From the point above named to Skynner's Cove the rock along the north side appears to be all gneiss with a variable strike in different parts. Around this cove there is a variety of micaceous, and hornblendic schists passing into thinly bedded gneiss. The average strike is about S.W. (true). I was informed by our interpreter, whose home is on the south side of the inlet, that the Eskimo obtained a kind of soapstone for making their pots in the vicinity of Skynner's Cove before they were able to procure others of metal. Along the northern part of the entrance to the inlet or about North Head of the chart, the rock is a coarse, dull red syentic gneiss. At one place it encloses a mass, like a bed, of nearly white quartzite marbled with small elongated gray patches, but it appears to be cut off as it runs up the slope, although another exposure of white rock was seen some distance off in a north-easterly direction. Here the glacial striæ were seen on projecting points near the water, running with the axis of the inlet or about east. At Mount Razorback, which forms the outer point on the north side of the Nachvak Inlet the stratification is well seen, the dip being to the southward. The angle of dip on the outer or eastern part of the mountain is almost 60°, but this diminishes to 45° and finally to less than 10°, in going to the south-westward. Several large but somewhat irregular dykes of black-looking rock cut the strata of the mountain side at right angles to the dip in its varying inclinations.

On the opposite or south side of the entrance of the Nachvak Inlet, the dip of the bedding is S.S.W. (true), and the inclination, generally from 35° to 40°, but at one part it is 60°. Dykes were seen all along, cutting the face of the mountain range and running in a south-easterly direction.

On the west shore of the first cove, from the entrance, on the south side of Nachvak Inlet, the rocks consist of a coarse-grained slaty tufa or breccia, thickly studded with grains of quartz-opal. To the north, this passes into a sort of coarse cleavable grey syenite, which could be traced for two miles westward along the shore; while to the south of it is a coarse grey mica schist, running N. 25° W. (mag.) vertical. In this rock, and near the slaty breccia, a vein of quartz was found, from a foot to two feet in thickness, and holding patches of brown-weathering calcspar.

The rocks in the mountain, overlooking the south side of the inlet, opposite Skynner's Cove, have a slaty appearance, with some great bands of a light color and more solid aspect, the outcrop running nearly horizontally for some distance. I was unable to visit these bands, but our interpreter brought me a specimen, which he said he had broken off one of them, and which proved to be a fine-grained light grey, silicious schist, which makes excellent hones. These and the other rocks on the south side of the inlet in this neighborhood, which have just been described, as well as a part of those on the north side, may belong to the Huronian series. Slaty rocks have been mentioned as occurring at Ramah, in the inlet, about twenty miles south of Nachvak. From the specimens which I have seen, these are probably of the same age, and they may be connected as one area with the supposed Huronian strata of Nachvak.

We were informed, both by Mr. George Ford, the agent of the Hudson's Bay Company at Nachvak, and our Eskimo interpreter, that at a short distance beyond the more distant mountains, seen to the west of the company's post, the country falls rapidly on the inland side, and soon becomes comparatively level. This description agrees with other accounts of the interior of the Labrador in the Ungava district. A wide level tract embracing the country drained by the George, the Whale and the Koksok, South, Big or Ungava Rivers, is said to extend southward a long distance from Ungava Bay. The surface is reported to be covered with a wet, peaty moss, growing upon barren sand, with the solid rock everywhere at a short depth beneath. The rivers and brooks are fringed with spruce and tamarac trees, but very little timber is to be met with between them. The mouth of the Ungava River is 155 miles south-west of Cape Chudleigh. In going by sea, from one to the other, Commander Bolton says, in the *Newfoundland Pilot*: "The high land of the Labrador shore could be seen towering above the scarcely discernable shore of Ungava Bay, for the first sixty or seventy miles." The Ungava River is navigable for sea-going vessels to a point three or four miles above the Hudson's Bay Company's post, Fort Chimo, and boats may ascend it for seventy or eighty miles. The river is from one-quarter of a mile to a mile and a-quarter in width. Its upward course is S. by E. (true), and it passes through a barren undulating country. Spring tides at Fort Chimo rise 38½ feet, and the rapid currents produce dangerous whirlpools. Salmon frequent the rivers of Ungava Bay in great numbers, and for some years the Hudson's Bay Company have annually sent a cargo of them, in a frozen state, by a small steamship, to the London market, in addition to a considerable quantity of the salted fish. Besides salmon, the trade of this port consists of furs, seal and white porpoise oil, and deer skins, and is carried on with the Eskimo of the coasts, Cree Indians from the south-western interior, and Nascopie Indians from the south-eastward.

Spruce timber begins to be met with, according to all accounts, about thirty miles to the south-west of the Hudson's Bay Company's post at Nachvak. The tamarac follows a short distance further south. To the westward of Nachvak, the northern limit of the spruce, according to Capt. William Kennedy, reaches the shore of Ungava Bay, north of the George River On the western side of this bay the Eskimo informed me it begins to be found in the neighbourhood of Bay of Hope's Advance, or five days' journey south-eastward of Cape Prince of Wales, on the south side of Hudson's Strait, and that in this neighbourhood it was found further north in the interior than near the coast. In addition to spruce and tamarac, balsam-fir, canoe-birch, aspen and balsam poplar are reported, on good authority, to exist in the interior of northern Labrador, but at some distance further from the coasts of the Atlantic and the Strait than the first mentioned.

On the East main coast of Hudson's Bay the northern limit of the spruce was found to be a few miles north of Richmond Gulf, but it was reported to extend much further north at a distance inland from this coast. On the west side of the Bay it was seen in considerable quantities all along the coast, from Cape Churchill to Button's Bay, and Mr. George McTavish, who has made several coasting voyages to the north, and who, at my request, has kindly made observations and collected information from the natives in regard to the distribution of timber, informs me that it

leaves the shore about twenty miles beyond Seal River. He was told by the Eskimo of these parts, who travel a good deal in the interior, that spruce timber begins to be met with at two days (say fifty-five miles) west of the mouth of Big River, and that it is considerably further inland, opposite to Eskimo Point, which is about in latitude 61° 40′. From this neighbourhood it runs west north-westward and crosses the Coppermine River about twenty miles from its mouth, and thence reaches nearly to the mouth of the Mackenzie River.

On leaving Nachvak, we sailed up the coast, passed round Cape Chudleigh, through Gray's Strait, which is between it and the Button Islands, and entered Ungava Bay. According to the chart and the *Newfoundland Pilot*, the cape rises to a height of 1,500 feet above the sea, and the highest point of the Button Islands has an equal elevation. The outlines of these islands and of the southern shore of Gray's Strait, although bold and steep, are rounded, as if they had been glaciated. At the west end of the south-eastern island of the Button group a great rock has been excavated into the form of a half arch, which rises out of the water and rests, at its summit, against the cliff which forms the extremity of the island. The rocks of the islands and the south side of the strait appear to be all gneiss.

On the Ungava Bay side of Cape Chudleigh we entered an inlet about ten miles southward of the extremity of the land, and discovered a harbour on its north side, which we named Port Burwell, after Mr. H. W. Burwell, the gentleman who was left in charge of the station (No. 1) which we built here. The hills, for a few miles around Port Burwell, are only moderately high and are not generally steep. Their outlines are rounded and their rocky surfaces have scattered upon them numerous boulders as well as finer rocky *débris*. The rock everywhere consists of ordinary varities of gneiss, the commonest of which are massive reddish and dark hornblendic and micaceous. The strike at the Port varies from N. 20° E. to N. 40° E. (mag.) The glacial striæ at the observatory station run S. 35° E. (mag.), but among the hills in the neighbourhood they were observed to follow the trends of the valleys with a general south-eastward course by the compass. A short distance south of the station, a vein, varying from 8 to 13 inches in width, occurs in the gneiss. Its direction corresponds nearly with the strike, which is here N. 20° E., running with the stratification for a short distance, breaking across to other beds, following them for a short distance and then jogging off to others. It consists of light grey dolomite and white quartz, holding a little iron pyrites and some crystals of quartz, rendered ruby-colored by a layer of oxide of iron under the faces.

From Port Burwell I explored the inlet to the south-eastward, and found it to be a strait dividing into two branches at five miles from the Port, the northern of which was ascertained to run through to the Atlantic. The Eskimo whom we met in this strait informed us (through our interpeter) that the southern branch also continued through to the ocean. They also told us that there was no other channel to the south of this between Ungava Bay and the sea to the east. We named this newly found channel McLelan's Strait, in honor of the Minister of Marine and Fisheries, and the north-west point of the main land, Cape William Smith, in honor of the Deputy Minister. At six miles from Port Burwell the northern branch of McLelan's Strait has contracted to half a mile in width, and has become flanked by high and steep hills, rising from either side. The tides, which at springs have here a rise and fall of upwards of twenty feet, run with great velocity through this narrow part. The locality is called Nunaingok by the Eskimo, which means the Hidden Place, and the same name is applied to one or two other localities on the Labrador coast. In proceeding from Port Burwell to Nunaingok, our course was S. 5° E. (mag.) or S. 55° E. (true), and the country on either side of McLelan's Strait showed less and less evidence of glaciation. Even close to the shore, in approaching the higher hills which begin at Nunaingok, the gneiss is deeply decayed, the softening process having extended particularly along the joints which run both vertically and horizontally, leaving only hard kernels with a more or less rounded outline, between them. Nunaingok is situated on an alluvial flat, extending between the two branches of the strait. The hill which rises steeply on the south side of it is about 700 feet high; but

further in, between the branches and on either side of them, the mountains are from 1,500 to 2,500 feet high, and have rugged tops and sides. Rounded boulders were found scattered all over the side and top of the hill just referred to; but although it had probably been somewhat glaciated, it had not been planed down to hard surfaces, but had an irregular outline, and the rocks were much disintegrated. Among the transported boulders and pebbles scattered over its surface, some of brecciated drab limestone with clear quartz grains, pinkish red sandstone, red jasper and magnetic iron, were noticed. Fragments of grey, drab and yellowish limestone, with obscure fossils, were common around the base of the hill. The glacial striæ were well seen on the southern side of the hill referred to, where, in one case, they were observed to groove longitudinally a vertical wall, and even the under side of an overhanging shelf of rock. The general direction was S. 25° E., or with the course of the south branch of the strait.

The fixed rocks around Nunaingok, as far as I had the opportunity to examine them, were all gneiss, the average strike of which was N. W. (true.) On one of the mountains on the north side of the northern channel a wide belt of brown, iron-stained rock runs diagonally through the ridge, the color being probably due to the decomposition of iron pyrites, but I had not time to visit the place.

At Nunaingok, on top of a bank of sandy earth, are the remains of an old Eskimo village. The roofs of most of the underground houses had fallen in, leaving only large circular pits. Some of these had become partially filled up, showing great antiquity. A few of the newest of them had been inhabited within a year. Some Eskimo camped in the vicinity informed us, through our interpreter, that this had once been a comparatively populous village, and a resort of their people as far back as their traditions extend. It is their custom to live in the underground houses from the commencement of winter, some time in November, till January, after which they leave them and spend the rest of the winter in igloes or snow houses. The water in the north branch of McLelan's Strait, they informed us, is open all winter at this point, and is much frequented by seals, which afford them a reliable supply of food. These animals they kill either from their kyaks or by spearing them from hiding places which they have built of stones on every ledge and point of rock past which the seals are accustomed to swim. Great numbers of bones of seals, walruses, reindeer, foxes, hares, birds, &c., lie scattered about on the surface and mixed with the earth around the old dwellings. The remains of stone pots and implements near others of European manufacture showed a transition from the barbarous to a civilized condition. I was told by one of the Labrador missionaries, who had had a long experience of these people, that the comforts and conveniences of civilization rendered the Eskimo less vigorous and healthy, and, as a consequence, their numbers are diminishing.

The "Neptune" was anchored in 15 fathoms at low tide in Port Burwell. The bottom was a sandy mud, and was found, by dredging, to abound with shellfish, echinoderms and crustaceans. During our stay, from the 5th to the 8th of August, the water teemed with fine cod, which were taken in great numbers by jigging. Many of them were tolerably large, and they were of excellent quality, contrasting, in this respect, with the cod we had got at Nachvak, Ford's Harbor and a fishing station on some islets we had passed to the south-east of it. Most of our crew had had more or less experience of the Labrador fisheries in previous years, and the superior quality of the Port Burwell cod was a subject of general remark among them. On our return to Port Burwell we found the fish still abundant on the 27th and 28th of September, and the party in charge of the station informed us that they could catch them any time they chose in the interval. At Nachvak the fishermen began to take cod on the 17th of July, and they were catching them in great numbers at the end of the month. During our stay in Skynner's Cove, in the inlet, from the 30th of September till the 6th of October, we caught as many as desired, by jigging from the ship's deck. From all that I could learn by enquiries along the Labrador coast and from our crew, it would appear that although the dates vary in different years and at different places, the average time for the cod to strike the shores is the middle of July, and that the particular time at any locality depends more on the presence or

absence of ice than on its latitude. If this condition happened to be the same all along, the fish would appear at the same time at every part of the coast. This would be the natural inference, since there appears to be no other difference in the conditions which would affect the cod along the whole coast. Bait is used as far north as Cape Harrison, but beyond that the fish are so numerous and voracious that the naked jigger alone is required. The fish are dried on flakes as far as Indian Harbor, but on the more northern parts of the coast they are spread upon the shingle or the smooth, rounded rocks.

Station No. 2 was intended to be placed on Resolution Island, or one of the Lower Savage Islands to the north-westward of it; but after spending part of two days in endeavoring to find an anchorage or a harbor on these islands, the attempt was abandoned until we should be returning after establishing the remaining stations. A near view of Resolution Island was not obtained on this occasion, but the southern shores of the Lower Savages were seen closely enough to determine the rocks to be massive gneiss, of which the prevailing color was red. The iron-bound shores of these islands rose abruptly several hundred feet above the sea.

On leaving the Lower Savages we proceeded up the Strait to the vicinity of North Bluff, but at a long distance from shore, until we came directly opposite to it. We anchored in a bay two miles east of the Bluff, which we called Ashe's Inlet, after Mr W. A. Ashe, D.T.S., who was to have charge of the observatory station (No. 3) which we proceeded to erect on the eastern side of the bay.

The rocks on the west side of Ashe's Inlet consist of dark grey gneiss, composed principally of quartz and felspar in even beds. The general strike, which is pretty uniform, is east and west (true), and the dip, north at an angle of 40°. On the higher levels the surface of the rock is decayed into half isolated boulder-like masses. In the vicinity of the station, on the east side, a common variety of gray micaceous gneiss is met with, striking with regularity to the N.W. (true). A mile to the northward, however, on this side of the inlet, it has become east and west (true), corresponding with the strike on the west side. The country was examined for several miles inland, or what I judged to be about the centre of the (Big) island, and found to consist entirely of common varieties of gneiss, with a prevailing westerly strike. It contains many veins of "hungry" or barren milk quartz. Some of them hold felspar and black mica, giving them a somewhat granitic character. In one of them the felspar, which was white, was observed to be striated. The hills have a rounded sweeping outline, and their summits are a considerable distance apart. The wide even spaces between them hold shallow lakes, surrounded with green meadow-like flats and mossy slopes. Numerous rivulets and brooks run down the hills and discharge the waters of one lake into another. The general aspect of the landscape reminds one of some parts of the Highlands of Scotland. A shallow looking lake, with many low stony points, begins about three miles northward of our anchorage, and has a length of about three miles. It discharges south and westward into Ashe's Inlet by a wide, rapid and shallow stream, which we called Edith River. The Eskimo informed us that at certain seasons large trout were abundant in this lake and river.

Around Ashe's Inlet the glacial striæ run about S. 65° E. (true). On the tops of the hills the rocks are much weathered and only faint traces of the striæ remain. In these situations ridges of gneiss boulders, with an easterly direction, were occasionally met with. One of them, on a hill a short distance north of the observatory station, has evidently accumulated in the lee of a knob of rock which stands at its western extremity. Among the prevailing gneiss boulders scattered on the hills and plains were found several of grey dolomite like that of the Manitouink group of rocks (Cambrian. See Geological Survey Report for 1877, p. 11 C.) and of the soft buff grey dolomite like that of the Churchill River. (See Geological Survey Report for 1879, p. 18 C.). I also found a large decomposed boulder which had been made up of coarse radiating crystals of greenish grey hornblende. A bed of the same rock was afterwards found interstratified with the gneiss at Cape Prince of Wales, on the south side of the Strait, opposite to Ashe's Inlet. A small piece of greyish crystalline limestone was picked up near

Ashe's Inlet, which bears a very close resemblance to a variety common in the Laurentian bands of the Ottawa valley.

Some heavy field-ice had drifted into Ashe's Inlet before our arrival there. The Eskimo informed us that this was the first time in their knowledge that such a thing had occurred, and this circumstance afforded us another proof of the unusual abundance of this kind of ice the present summer. Several of the pieces or "pans" were upwards of 20 feet thick, aud as the tide has here a rise and fall of more than 30 feet, some of them were left dry at low water and were found to consist of solid blue ice. The outlines of these pans, as seen floating in the sea, more frequently approach a quadrilateral form than any other. This kind of ice was afterwards seen in great quantities around Salisbury and Nottingham Islands, in the mouth of Fox's Channel, down which there appears to be no doubt, all the heavy ice of Hudson's Strait, comes. On reaching the Strait it projects towards the south shore and breaks off in fields of greater or less extent which float up and down with the tide, always working to the eastward, and part of it finally escapes into Davis' Strait. Hudson's Strait, however, being about 500 miles long, the tendency of the wind and tide is to drive much of it ashore, or to imprison it in bays and inlets. Once it has reached such situations, the lee afforded by the high lands often prevents it from being drifted out to deep water again. In this way, during the present season a large quantity of it became fixed in Ungava Bay and detained the Hudson's Bay Company's steamer "Labrador" for twenty-one days, being the first time, I understand, that any detention of the kind has taken place Mr. L. M. Turner, of the Smithsonian Institution, who was at Fort Chimo at the time, informed us that the thickness of some of these blocks of ice was measured, and in one case found to be as much as 42 feet. Mr. Burwell, at Station No. 1, on the west side of Cape Chudleigh, reported that, during August and September, he observed these heavy pans floating south-westward into Ungava Bay, but never returning past his station. At Ashe's Inlet the observer reported that the ice always floated back, or westward, a short distance, with each tide, but finally disappeared to the eastward. Some of this heavy ice was stranded about Cape Prince of Wales in the latter part of August and the first half of September, but it had all gone when we re-visited the station here on the 23rd of September. At Nottingham Island we observed some of the heaviest "pans" stranded in 6 fathoms of water, and they would, consequently, be about 40 feet thick.

I tested the ice of the stranded pans in some places, and always found it fresh. This would be the case, notwithstanding that the ice formed in sea water, for most of the salt would be thrown out in the freezing, and what might remain would drain away near the surface on exposure to the mild air of summer. Owing to the somewhat poor heat-conducting power of ice, it is not possible that so great a thickness as 40 feet could form in one winter in Fox's Channel. It is probable that a good many years would be required. In regard to the quantity of ice which has been observed in Hudson's Strait, a study of the experience of the vessels which have navigated these waters, as well as of that of the ships of the Moravian Brethren coming to the coast of Labrador, would seem to show that there is a succession of good and bad years, with a minimum, and a maximum at perhaps seven or eight years apart, or in cycles of some fourteen or fifteen years; also, that there may be a maximum intensity in these cycles themselves, so that perhaps every third one will be more favourable in the minimum of ice and more severe in the maximum than the two intervening ones.

The fact that most of the ice-pans of Hudson's Strait, when not covered with fresh snow, are colored with dust and earth, points to their formation near shore, and also to their remaining there during one summer at least, when the ground is bare of snow and the surface not frozen. The dust appeared to be in too great quantity to be of cosmic origin. These pans sometimes carry gravel on their backs, a circumstance which was noted in my report for 1880, p 20 C. When at Ashe's Inlet, a fact was observed which may explain the last mentioned phenomenon. Some tolerably thick ice still remained attached to the shore at high tide mark. During the melting of the snow on the hills above it, torrents had carried a quantity of stones and earth

out of an adjacent bank and deposited them upon the surface of the ice. The connection between this ice and the shore being sufficiently weakened, the next spring-tide would carry it out to sea, as previous tides had already carried parts of the adjoining ice, similarly laden.

The icebergs of Hudson's Strait are of comparatively small size and are or have been mostly flat-topped. The original appearance of some of them has been altered by foundering and canting, which have occasionally been repeated several times, the various positions which the berg has occupied being indicated by water-lines now standing at different angles to the surface. These small icebergs are most numerous along the northern side of the Strait, and they have never been observed west of Fox's Channel, out of which they proceed. They are supposed to originate from glaciers on the shores of this channel, but it is possible that they may come through the passages which are believed to run into it from Baffin's Bay and Lancaster Sound, or through Fury and Hecla Straits, in all of which the current is known to set southward.

The soil or drift material of Hudson's Strait is probably permanently frozen at a certain depth below the surface, although our interpreter told me it was not so at Nachvak, nor does it appear to be the case at Nunaingok, in McLelan's Strait. On Nottingham and Digges Islands, when the gneiss has been glaciated and its hard surface exposed to the cold, it appears to have become so deeply chilled that its temperature does not rise above the freezing point in summer, except in the direct sunshine. Whenever water in small quantities had flowed over these rocks at night or in the shade during the day it had become frozen.

While the "Neptune" was lying at Ashe's Inlet a party of Eskimo from the eastward came on board. They brought with them plates of good, light coloured mica and pieces of pure foliated graphite, also a small piece of iron pyrites, and one of amorphous graphite. In reply to questions, they stated that they came from a place called Kimnirook, about two days' journey by kyak, to the eastward, and that they had gathered these specimens in that vicinity. They further stated that there was plenty, both of the mica and the foliated graphite. Having assembled these visitors, and also the Eskimo of North Bay, who were already at the Inlet, a party of thirty-eight in all, I exhibited to them my collection of minerals, and passing them round, one at a time, enquired successsively if any of them had ever seen a mineral like that. In return for any information which they might give, I offered them tobacco, ammunition, kettles, &c., all of which they coveted very much and might easily have invented stories as to the occurence of minerals in these regions in order to gain the articles offered. But the only kinds they recognized, besides those of which they had brought the specimens above mentioned, were a bright red hæmatite occurring inland from Kimnirook, and a rather hard and inferior variety of soapstone, which they used for making pots before they obtained metal ones from the white men, at the western end of Big Island (in which this inlet and North Bluff are situated). They said they had observed plenty of hard white stones, like the quartz exhibited, in various localities, but no soft white ones such as the marble, gypsum, barytes, &c., the hardness of which they tested with their knives.

During our stay at Ashe's Inlet, the Eskimo killed two reindeer in the vicinity, and, judging from the numerous tracks, of these animals they would appear to be common; but the natives informed us that they were much more abundant on the mainland to the north, where they are in the habit of hunting them most of the summer, coming again to the sea shore to live on seals and walruses during the winter. Three young harp seals were killed in the inlet during our visit, and as we steamed out of it we saw two walruses. One of our party obtained the tusk of a narwhal from the Eskimo who visited this inlet. Arctic hares were numerous on a small island, to which the foxes could not gain access. Gulls, gannets, guillemots, eider ducks and ptarmigan were the commonest birds. The young of the last named were about three parts grown on the 15th of August, and could fly with the adult birds. The Eskimo informed us that large trout were abundant, at certain seasons, in what we named Edith Lake and River, a few miles north of the observatory station.

Driftwood, all spruce, of which a considerable quantity had been seen at Port Burwell and in McLelan Strait, was entirely absent at Ashe's Inlet, and Nottingham Island, and was scarce at Digges Island and Cape Prince of Wales.

We left Ashe's Inlet on the evening of the 16th August, and arrived at Cape Prince of Wales, on the opposite side of the Strait, on the morning of the 17th, the distance being about 60 geographical miles, and the course about S. S. W. (true). Prince of Wales Sound lies to the south-eastward of the cape, and appeared to be about 15 miles broad. We selected a place on the inner side of the cape for building the observatory station, and named it Stupart's Bay, after Mr. R. F. Stupart of Toronto, who was to have charge of it. The highest hill on the west side of the bay was ascertained to have a height, according to the barometer, of 340 feet, and the highest to the south of it to have a height of 180 feet. The rocks in the vicinity of the bay were found to consist entirely of Laurentian gneiss. In the hills on the west side of Stupart's Bay, the strike is from S. to S. 40° E. (mag.), or nearly east and west (true). The gneiss in the hills, both to the south and west, is cut by numerous veins and bunches of milk-white quartz, which in various parts are so conspicuous on the bare surface as to be seen from considerable distances. In one place on the eastward slope of the hill to the west a group of parallel veins of this mineral, varying from a foot to two feet in width, is traceable for some distance. Their course is slightly sinuous, but the average run is N. 55° W. (mag.). Red felspar occurs in some of these, and occasionally a little black mica. The top of this hill is rounded and striated. The glacial grooves are quite distinct. On the highest point their direction is S. 60° E. (mag.). A little below the summit, on the south side, they run S. 50° E., while at the observatory station, near the sea shore, their course is S. 40° E. (mag.).

Viewed from the top of the hill just referred to, the slopes and valleys to the north-eastward are full of ponds resting in basins of solid rock. Boulders are perched on the summits and slopes of all the hills around. Beaches of shingle, as fresh looking as those on the present sea shore, except that the stones are covered with lichens, may be seen at all levels, up to the tops of the highest hills in this vicinity. The long sloping hillside to the south of the observatory station is covered with fields of shingle and small round boulders, all blackened by the lichens. At the northern base of the ridge, to the north-west of the station, is a large dry basin-like depression, with a notch on the outer side, through which it has formerly communicated with the sea. From the notch, the shingle and mud are spread over the floor of the basin in a fan-like fashion, as if the tides had rushed violently in through this opening. The materials of the raised beaches above referred to consist principally of gneiss with milk quartz from the veins of the neighbourhood, together with a few fragments of yellowish grey dolomite, with obscure fossils, a hard and nearly black variety of silicious clay-slate, with an occasional boulder of dark, hard crystalline diorite.

Prince of Wales Sound has a breadth of, apparently, about fifteen miles, in a due S. E. bearing from Stupart's Station, on the inner side of Cape Prince of Wales, and of probably eight or ten miles in a southerly direction. A long arm, the north shore of which I reached at two and a-half miles due S. W. from the station, runs due west from the western side of the sound. This appeared to be the favourite resort of the Eskimo, and I propose to name it, for convenience, Eskimo Inlet. A small rapid river was crossed between the station and the inlet. The Eskimo informed me that another river enters the head of this inlet, and that it passes through two good sized lakes not far from the sea. Some large trout, which they had brought to the ship, were stated to have been caught in this river. Salmon were said to be found in another river entering the sound at a point about south of Stupart's Bay.

The hills of gneiss between Stupart's Station and Eskimo Inlet are pretty thoroughly glaciated. The ridges and hummocks, as a rule, present smooth gradual slopes to the west and abrupt craggy faces to the east, showing that the movement of the ancient ice was from the west. The striæ are well seen in many places on the hills, the average direction being S. 40° E., (mag.) or about due east, astronomically. On the shore of the inlet they run a little north of true east or parallel with the course

of the inlet itself. Here I found a good many boulders of grey and yellowish limestone on the beach.

The gneiss along the northern shore of Eskimo Inlet is of the ordinary variety, and has an average strike of N. 20° W. (mag.) One of the veins of white quartz in this locality contains purplish red calcspar, in rather coarse crystals of a uniform size, both the color and texture closely resembling some varieties of the banded crystalline limestones of the Laurentian series in the County of Lanark. Dark crystals of epidote occur along with it. Light green amorphous epidote and a bright red felspar are associated in some of the quartz veins of the vicinity. One of the Eskimo had a small lamp made of a soft, grey variety of schistose mica rock, which he said occurred on an island in Prince of Wales Sound.

From a hill near Eskimo Inlet a view was obtained far inland to the west. The surface of the country in that direction appears in long sweeping outlines, terminating in mountain ranges in some of the higher parts, and resembles the landscapes in various parts of Newfoundland.

The Eskimo report reindeer to be plentiful around Prince of Wales' Sound at certain seasons, being most abundant, I understood, in the winter. During the interval between our two visits to the sound, the natives killed several, and a member of the observatory party shot one in the vicinity of Stupart's Bay. These people also told us that the polar bear was common on the southern shore of the Strait, to the west, and that Ane-ugi, or Snow Island, about eight miles above Cape Prince of Wales, was a favourite place for them to land. The walrus is found at this cape at most seasons of the year. We saw several in going out and in with the "Neptune," and our interpreter killed one while we were lying in Stupart's Bay.

The Greenland, or harp seal, (*Phoca grœnlandica*, Fabricius) was the species on which the Eskimo were living during our visit to Prince of Wales' Sound, but they had in their possession the skins of a good many harbor and square-flipper seals. (*Phoca vitulina*) (Linn.) and *Erignathus barbatus* Fabricius). Some of the last mentioned were very large, stretching from the apex of a wigwam to the ground, and measuring 11 or 12 feet in length.

In reply to questions put to the Eskimo here, through our interpreter, they informed us that not only the Strait itself, but even Prince of Wales' Sound, did not freeze over in the winter, but that ice drifted up and down with the tides. They stated that ice formed in the coves and around the shoals and islands off the cape. The chief reason why they live in this vicinity is that Cape Prince of Wales being "a good place for ice" they are more certain of a steady supply of seals and walruses than elsewhere.

As to the supposed passage or channel between Bay of Hope's Advance and Mosquito Bay, they did not appear to have any personal knowledge. Our interpreter did not think it existed, but as he came from the eastern Labrador, he had no definite idea on the subject. Being an egotistical individual, and wishing his own opinion to prevail, it was impossible for me to get a fair expression of the views of these people on this important matter.

We left Stupart's Bay at Cape Prince of Wales, on the evening of the 22nd of August, and arrived at the southern part of Nottingham Island on the morning of the 24th. In passing the south side of Salisbury Island, the hills of the western part were observed to have more even outlines than those of the eastern, as if the glacial force had come from the westward. We anchored in 5 fathoms of water, in an inlet a few miles east of the most southern part of Nottingham Island, and found a suitable place for the station close to our anchorage, and on the north side of the inlet, which we named Port DeBoucherville, after Mr. C. DeBoucherville, of Ottawa, who was to have charge of this observatory.

Around Port DeBoucherville, and for some distance to the westward, the country consists of island-like hummocks of rock, more or less separated from one another and surrounded by clayey mud. The lower parts of these muddy intervals are partly overflowed by the tide, rendering the water turbid in all the bays and inlets of this part of the island. The clay is mingled with boulders and gravel, and it extends below the bottom of the sea on the one hand, and up the valleys to a height of 50 to

100 feet. In preparing to leave the port, it was found difficult to start our anchor out of the mud, some of which came up on one of the flukes, and proved to be an exceedingly tough bluish-grey clay, containing grains of coarse sand disseminated through it.

I explored the country to a distance of about three miles in various directions from our anchorage, and found the rocks to consist of common varieties of gneiss, the only exeptions noticed being patches of a fine-grained red syenite on both sides of the inlet. The average direction of the strike is south-west (true) but there are numerous local variations which, however, seldom carry its course outside of the south-west quarter of the circle. The joints in the gneiss run about east, or nearly parallel with the glacial striæ, and this is also the direction of a number of long cuts and straight valleys or gorges in the gneiss, which have, therefore, an oblique angle to the strike. The bottoms of these depressions are filled with boulder clay, which, on the surface, has a structural arrangement parallel with the walls, apparently due to a process of expansion and contraction and of heaving, on account of the intense frost of this region. In narrow cuts or gorges the heaving of the clay was greatest along the sides, which had the effect of sorting out and throwing the boulders to the centre, where they formed rows as regular as if they had been placed artificially.

The direction of the joints in these rocks may also be that of dykes and veins, which, owing to decay and subsequent glacial action, would now be concealed in the bottoms of the depressions above referred to. At a projecting point on the side of one of them, however, and running parallel to its walls, I found some straggling veins of hard grey dolomite, weathering brown and holding scales of mica.

The rocks of the lower levels are well glaciated, and from upwards of twenty trials in various situations around Port DeBoucherville, the average course of the striæ across the south end of Nottingham Island was ascertained to be S. 30° E. (mag.), or only a few degrees southward of true east. That the direction of the glacial movement was towards the east is obvious from the contour of the *roches moutonné*, the mode of the fluting of perpendicular walls and of channels cut in the rocks, as well as by the direction of the curves of the semi-circular lines across the larger grooves themselves. A valley, with a south-eastward bearing, enters the head of Port DeBoucherville, and along it the grooves partake of the same direction, showing that while the low southern portion of the island was swept by a great glacier from the west, another was traversing it from the north-west. Nearly half of the boulders, stones and gravel of the drift are grey limestone, like that of the Manitounik (Cambrian) group, indicating the proximity of these rocks to the westward. The grey quartzite of this series is also well represented. One piece of this rock contained the characteristic spherical spots of a softer nature and lighter colour, which usually weather out into hollows on exposure. There are also fragments of black slate and red jasper, both of which have been found in the Manitounik group. Two pieces of fine-grained white quartzite were noticed, which may have come either from rocks belonging to this group or to the Huronian series. A fragment of red sandstone conglomerate was also observed, of the same kind as that which underlies unconformably the Manitounik rocks, and is so largely developed at Little Whale River and Richmond Gulf. (See Report of the Geological Survey for 1877, pp. 13 and 14 C.) No shells were found in the boulder-clay, but a few common species were abundant in a bank of stratified sand, having a height of about 8 feet above high-water mark at the head of a bay.

During the interval between our two visits to Nottingham Island, the observatory party saw a few reindeer, but the numerous tracks and droppings of these animals show that they exist here in considerable numbers. Several of their shed antlers were found, and all of them had the upper tines curiously hooked and curved inwards—a peculiarity which would be incompatible with forest life. We saw a few walruses when first approaching the island, and while the station was building, but they were quite numerous upon the ice which we passed through to the south of it on our return on the 20th of September. These animals accompany the ice during the summer, and its unusual prevalence in this quarter the present season was shown by the blighted condition of even the Arctic vegetation of the island. Arctic hares and foxes were seen, and both appeared to be abundant.

Among the more noticeable birds which breed on Nottingham Island, are the Arctic loon (*colymbus arcticus*, Linn), and the whistling swan (*cygnus americanus*, Sharpless). We killed four old swans, all moulting, and two young ones, nearly full grown, on the 27th of August, and the male, female and young of the Arctic loon.

At Port DeBoucherville I found distinct remains of a very ancient Eskimo camp in the form of heaps and circles of stones, like those of the modern Eskimo, on a raised beach at the head of what had been a cove. From what I have seen of the situations, which the Eskimo, in various places in Hudson's Bay and Strait, choose for their camps, there appeared to be little doubt that they had lived here when the sea-level was 20 to 30 feet higher than it is at present. On the rocks facing the open Strait, just south of the inlet, the more recent works of these people are well preserved, although they are probably upwards of 100 years old. Besides numerous rings of tent-stones and some shapeless heaps, there are here several rectangular walls a few feet high, and caches of a bee-hive form, each about 6 feet in height and 7 feet in diameter. Two of the latter are nearly complete, and are adapted either for storing meat or as hiding places or "stands" from which to kill game. A good photograph of one of them was obtained.

When we left Nottingham Island, it was proposed to place the next station on the south point of Mansfield Island, but the locality having been found unsuitable, the station was built on Digges Island, off Cape Wolstenholm, on our return voyage. As the geographical position of this station comes next in order, I shall now state the observations which were made during our visit to the locality. Heretofore the name Digges or Cape Digges has been applied on the sketch charts to several islands, represented as lying off Cape Wolstenholme. Our explorations went, however to show that there is only one island from ten to fifteen miles in length. The bare hills of which it is composed are divided into several detached groups by straight, transverse valleys, cutting well down towards the sea-level, thus giving the appearance of separate islands, when viewed from a distance. The greatest length of the island lies about east and west (true). As this is also the commonest direction of the strike of the gneiss, most of whichis is red, and also of the glacial striæ, the island has become divided by longitudinal valleys, some of which, too, were traced in nearly straight courses for several miles.

We found a good harbour on the south side of the island, about a mile from its western extremity, well sheltered from all quarters except the south-west, with good holding-ground and a convenient depth of water. The station was built on its south-east side, and placed in charge of Mr. A. N. Laperrière of Ottawa, after whom the harbour was called Port Laperrière. Only a narrow neck of land separates the head of the harbour from Hudson's Strait to the north. Between this and the western extremity of the island the hills have a rounded outline, and raised beaches, composed mostly of coarse shingle, form a prominent feature on their slopes, all the way from high tide mark to their summits, the highest of which is between 300 and 400 feet.

On the north side of Port Laperrière a light-colored quartzose band of gneiss contains numerous claret-colored garnets. Here the strike is N. 35° W. (mag.), but to the eastward of the harbour it is N. 45° W. (mag.), the bedding running in straight lines over a considerable area. At four miles east of the harbour, and towards the north side of the island, the gneiss strikes N. 50° W. (mag.). A well marked valley, with a chain of lakes along its bottom, comes to the south side of the island, about two miles east of Port Laperrière. It runs about east by north (true), and was explored for five or six miles without coming to the end of it. The general strike of the gneiss was parallel with the valley all along.

The red gneiss, which rises from the shore on the north side of the valley, running eastward from the head of the harbour, is cut by two parallel fissures, only 3 or 4 feet apart, with well defined, slikensided walls, the intervening mass simulating a vein; but it is composed of red gneiss, all divided into small, sharp, angular pieces by a multitude of joints intersecting each other in all directions, and often lined with green epidote, which in this region very frequently accompanies veins and

dislocations. These fissures run in a north-easterly direction, but curve about a good deal. They are accompanied by a small quantity of a handsome variety of red pegmatite, the quartz of which is blue, and the mass is occasionally streaked with bright-green epidote.

Around the western part of Digges Island the course of the glacial striæ is from S. 70° E. to S. 75° E. (mag.); but in the interior it averages S. 55° E. (mag.), or with the general direction of the valleys.

We saw no Eskimo about Digges Island, but they appear to have visited Port Laperrière in recent years, as the remains of their camps were found in two or three places close to high tide mark. Some ancient camping places were also observed around this harbour, which, from their elevation above the present beach, the decayed nature of the larger bones lying about and the manner in which the circles of stones were embedded in the moss and overgrown with lichens, were supposed to be from 100 to 300 years old. Still more ancient works of the Eskimo were discovered in the valley which comes down to the head of the harbour. These consist of a row of stones lying in the vegetable matter at the surface, touching each other and running at right angles to the brook, at a contracted part of the bottom of the valley, which would be suitable for the Eskimo method of trout-fishing if the sea were 75 or 80 feet higher than it is at present. If the sea has receded as rapidly as 7 feet a century, these works would be upwards of 1,000 years old, and if the rate has been less they must be even more ancient.

The same day that we arrived at Port Laperrière (16th September) a she polar bear and her two cubs were killed in the interior of the island, about two miles from the ship. The cubs were somewhat larger than sheep, and were probably between seven and eight months old. Our party having approached them cautiously, one of them was observed sucking its mother. I examined the stomachs of all three, and found them to contain nothing but partially chewed grass. About four quarts of this were found in the stomach of the old bear and two and a-half and one and a-half respectively in the cubs' stomachs. I had been informed by some Eskimo and Hudson's Bay Company's people that the polar bears sometimes eat grass, and I had occasionally seen along with their tracks, dung which could scarcely have been dropped by any other animal, and which was made up of the remains of comminuted grass and other vegetable matter. The three bears referred to were killed on a grassy spot where they had spent some time, apparently for the purpose of eating grass, and this was propably their only object in wandering away from the sea. The presence of the newly swallowed grass in such quantity in the stomachs of all three convinced me that these creatures live, to some extent, on vegetable food. On the 30th of August, while sailing down the east side of Mansfield Island, we saw a large polar bear and cub running along the rocks about a mile back from the shore. Walruses were numerous around Digges Island during our stay there. They were always in the water and were generally seen in groups of from three to seven or eight.

We arrived at the eastern part of Mansfield Island, about mid-way down, on the morning of the 30th of August. Its even outline presented a remarkable contrast to the shores of Hudson's Strait. It resembled a gigantic ridge of gravel; but stratified rocks, in low horizontal ledges, appeared here and there, through the *dèbris*, at different levels. At one place, four or five miles inland, the island rises to an elevation of about 300 feet above the sea, and this was the highest point observed upon it. Small streams appear to run out upon the eastern shore, as narrow cañons are cut in the rock in a few places. The monotony of the eastern slope of the island is broken at one locality by the rocks projecting through the *dèbris* in a form resembling an old castle, with three towers on the left, and a wall broken through by embrasures on the right. A short distance to the south of this there is a cliff, with a distinct pillar on the left. These points are considered worth noting, as they have a bearing on questions as to the glacial phenomena of these regions. For many miles, the whole of the eastern slope of the island presents a succession of steps or small terraces, mostly too low to be distinctly counted, but there might be a hundred of them

between the sea level and the highest parts of the island visible. These appeared to be partly ancient beaches, and partly the outercropping edges of nearly horizontal strata. I landed at a point about the middle of the eastern shore of the island, and found the shore very flat, with shallow water for a considerable distance out. The rock proved to be a fossiliferous grey limestone, in rather thin horizontal beds. The fossils were obscure and scarce at the place referred to. Those collected, Mr. Whiteaves thinks, are Silurian. The rocks themselves resemble the Lower Silurian limestones of the Red and Nelson Rivers. I landed again near the south end of the island, and found the water very shallow in approaching the shore. No rock was detected in situ at this place; but a great extent of gravel and coarser shingle, derived from limestone like that found in situ further north was thrown into a succession of long, low ridges and terraces, all curving with the contour of the land. Behind most of the ridges I met with long ponds of clear, fresh water. A number of caches and "stands," built by the Eskimo, were seen along the shore of Mansfield Island, but none of these people were observed.

From the southern extremity of Mansfield Island we steamed to Cape Southampton, and thence coasted north eastward, in the hope of finding a suitable site for building an observatory station, but without success; and after making between twenty and thirty miles in that direction, we returned to the cape and passed round it to the westward, shaping our course thence for the opposite side of Hudson's Bay. The general charter of this island, and the part of its shore which we examined, are quite like the eastern side of Mansfield Island. It has rather more vegetation upon it than the last named island, and much of the surface has a brown colour in consequence. Shallow water, having a light green colour, extends some distance out all along. The island slopes gradually up from the beach and is thrown into a great many small terraces. The highest point seen did not exceed 200 feet above the sea. I noted that the limestone is evidently exactly the same as that of Mansfield Island. Low cliffs in the upper levels break through the decayed mass and the *débris*, and horizontal ledges also make their appearance through the loose materials near the sea beach.

We did not observe any natives on the part of the island which we saw, but at four miles north-east of Cape Southampton there were three fresh houses of the Eskimo, covered completely with sods and moss, and having the doors built round with stones. About three-quarters of a mile to the north-eastward of these were five old Eskimo houses, built of stones and sods, with some sticks and bones lying on their tops.

Our first landing place on the western side of Hudson's Bay was Marble Island, but we had a distinct view of the land between it and Chesterfield Inlet. Judging from specimens which I have received through the kindness of Mr. George McTavish, of the Hudson's Bay Company, a portion of this coast is occupied by rocks, which may be referred to the Huronian series, among them being diorites, hornblende-schists and glossy mica-schists characterized by numerous cubes of iron pyrites. On the coast opposite to Marble Island, the last named rock appears to contain the veins of granular iron pyrites, an assay of a specimen from one of which, from Iñari, was made by Mr. Hoffmann in 1879. (See p. 23 H., Report Geological Survey, 1878-79.) These glossy mica-schists were found on Deadman's Island, near the west end of Marble Island. From all that I have been able to learn on the subject, a set of rocks, very like those of the Township of Ascot, in the Province of Quebec, and holding similar pyrites veins, which are of great economic value, will be found in this part of the western coast of Hudson's Bay.

The harbour on Marble Island, which is resorted to by the American whalers, and in which we also anchored, is situated on the south side of the island, about two and a-half miles from the western extremity. The outer harbour is formed by Deadman's Island, about quarter of a mile long, lying across the front of a small bay. The inner harbour is a basin, which connects with this through a narrow gap in the rock with only about one fathom of water at low tide.

Deadman's Island consists of white and light grey quartzites and glossy mica-schist, striking N. 75° W. (mag). The glacial striæ on this island are well marked and run

S. 10° E. (mag). In the course of the day which we spent at Marble Island, I rowed round its western end and thence eastward along its northern shore for some miles. I also explored the interior and took some photographs between this side of the island and the harbour. The whole of the western part of the island consists of white and light coloured quartzite, bearing a strong resemblance to white and veined marble, from which circumstance it has no doubt received its name. Viewed from sea, the shores have a very white appearance, the rocks being free from lichens, &c., and the hills in the interior, which are rounded, are also pure white, and contrast strongly with the dark brown of the peaty flats and hollows. Even the boulders and coarse shingle forming the raised beaches remain quite white, and these beaches appear as conspicuous horizontal lines against the dark vegetable matter. The beds of quartzite are usually very massive. Their surfaces are often ripple-marked, the ridges and hollows varying much in size, being sometimes as fine and regular as the fluting on a washboard, and at others two or three inches apart. On the south side of the island, near the west point, the quartzite is of a beautiful lilac tint, some of the beds being more deeply coloured than others. The strike is here N. 80° W. (mag.), the dip being to the northward, at an angle of 80°. The surface of the rock at this place is marked by large green stains of carbonate of copper, some of them being 3 or 4 feet in diameter. They appear to be due to the decomposition of small quantities of copper pyrites in the quartzite.

At the north-west point of the island the dip is N. 75° W. (mag.), angle 45° and the striæ here run S. 20° E. (mag.). This is also the prevailing dip in the interior of this part of the island. On the north shore of the island, opposite to the harbour on the south side, the dip is N. 60° W. (mag.), angle 40°. Not only does the strike vary considerably on the large scale, but the lines of stratification were in places observed to undulate a good deal on a small scale, while the general course of the beds was pretty straight, the minor variations appearing as mere corrugations of the darker lines of stratification on smooth sections.

Although quartzite was the only rock found in situ on the main island, so far as I had time to explore it, the *debris* of the glossy mica-schist with cubes of iron pyrites, was so abundant along the north side that I have no doubt it exists "in place" close by. A fragment of the peculiar brown-weathering dolomite with white quartz, strings of the Huronian series, was also found on this part of the island.

We left Marble Island in the evening of the same day that we arrived there (2nd September), and entered the harbour of Churchill on the 6th. The geology of this locality is described in my report for 1879, pages 19 to 21. After leaving Churchill we paid a visit of twenty-four hours to York Factory, from which we sailed for Digges, where we built station No. 5, as already stated, and after visiting all the other stations and building the one at Nachvak, which has been described in a previous part of this report, we continued our homeward voyage to St. John's, Newfoundland, which we reached on the 11th of October, and left the same evening for Halifax, where we arrived on the 14th and at Ottawa on the 16th of the same month.

GENERAL REMARKS ON GLACIATION.

It will be seen by an inspection of the chart, that Fox's Channel, in respect to width, general direction, &c., is a continuation of Hudson's Strait, and that the outlet of Hudson's Bay joins this great channel at right angles. It is much deeper than Hudson's Bay, the comparative shallowness and the uniformity of the bottom of which are remarkable features. If the sea in these latitudes were only about 100 fathoms lower than it is at the present time, James' and Hudson's Bays would become dry land, while the Strait would remain as a long bay, but with a slightly diminished breadth. The bottom of the Bay would have become a plain, more level in proportion to its extent than any other on the continent. The numerous rivers which now flow into it would traverse this plain, converging towards the north-east and falling into the Strait near Cape Wolstenholme, after having, perhaps, formed one immense river, flowing northward down the centre of the Bay, or probably nearer the East-main side.

During the "great ice age" the basin of Hudson's Bay may have formed a sort of glacial reservoir, receiving streams of ice from the east, north and north-west and giving forth the accumulated result as broad glaciers, mainly towards the south and south-west. It has been shown, in a preceeding part of this report, that the direction of the glaciation, on both sides of Hudson's Strait, was eastward. That an extensive glacier passed down the Strait may be inferred from the smoothed and striated character of the rocks of the lower levels, the outline of the glaciated surfaces pointing to an eastward movement, the composition of the drift, and also from the fact that the long depression of Fox's Channel and the Strait runs from the north-westward towards the south-east, and that this great channel or submerged valley deepens as it goes, terminating in the Atlantic Ocean. Glaciers are said to exist on the shores of Fox's Channel and they may send down the flat-topped icebergs which float eastward through the lower part of Hudson's Strait into the Atlantic. During the drift period, the glacier of the bed of Hudson's Strait was probably joined by a contribution from the ice which appears to have occupiedthe site of Hudson's Bay, and by another also from the southward, coming down the valley of the Koksok River, and its continuation in the bottom of Ungava Bay. The united glacier still moved eastward round Cape Chudleigh into the Atlantic.

Throughout the drift period, the top of the coast range of the Labrador, stood above the ice and was not glaciated, especially the high northern part. Further south on this coast, the range is lower and there may also have been more ice in this direction. Here the valleys and the hills, up to the height of 1,000 feet, at any rate, have been planed by glacial action, the course followed by the ice on the eastern slope having been down the valleys and fjords directly into the sea. In the southern part of the Labrador peninsula, the general course of the ancient glaciation appears to have been southward, varying to the eastward or westward with the courses of the rivers and valleys, and coming to the north shore of the Gulf of St. Lawrance, in a general way, at right angles to the coast line. On the island of Newfoundland, the glaciation appears to have been from the centre towards the sea on all sides.

ROBERT BELL.

Mortimer & Co Ottawa

REPORT

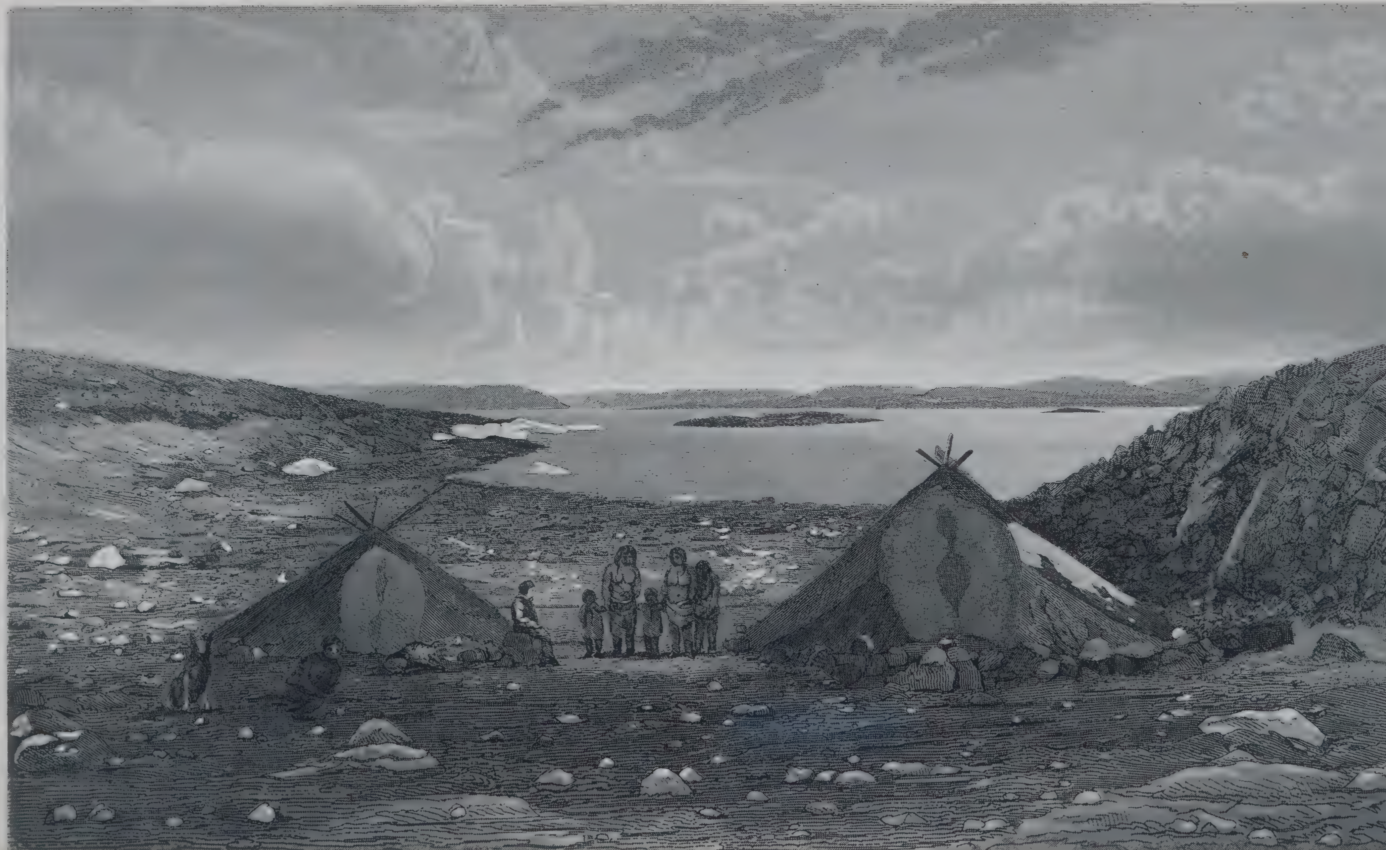
OF THE SECOND

HUDSON'S BAY EXPEDITION

UNDER THE COMMAND OF

Lieut. A. R. GORDON, R.N.

1885.



British American Bank Note Co. Montreal

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REPORT

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REPORT OF THE HUDSON'S BAY EXPEDITION OF 1885, UNDER THE COMMAND OF LIEUT. A. R. GORDON, R.N.

The Honorable
The Minister of Marine and Fisheries,
Ottawa.

SIR,—I have the honor to report on the Hudson's Bay Expedition of this year, under my command as follows:—

In accordance with your instructions I left Toronto on April 27th, and after visiting Ottawa, and receiving your final instructions, I went to Halifax to take command of H.M.S. "Alert," to proceed with the purchase of stores, and generally with the organization of the Expedition.

I arrived at Halifax on May 3rd, and found that the "Alert" had been handed over by the Senior British Naval Officer in command at Halifax to Mr. H. W. Johnston, the Agent of the Department of Marine at Halifax. On the morning of May 4th I brought the "Alert" alongside the Marine Department wharf at Halifax, and proceeded with the work of fitting her out for the Expedition.

The "Alert" is a screw steam ship, barque rigged, of about 700 gross tons, and was specially rebuilt for the Arctic Expedition of 1876 under the command of Sir George Nares. She is so constructed as to be capable of resisting great ice pressure, and her engines being only fifty horse power nominal, the screw is small and strikes when the ship is at her load line several feet below the water, so that in every way she was well adapted for the work of the Expedition.

The engines are compound surface condensing and when running at full speed make about 120 revolutions per minute, which in smooth water and calm weather gives the ship a speed of about eight and a half knots. The consumption of fuel when using the best Welsh coal, and steaming full speed, was a little less than six tons per day, but on ordinary occasions with the expansion gear on, the ship would steam about six knots per hour on an average consumption of about four tons per day, and when steaming slowly in slack ice, only using one boiler, we could make four knots on two tons per day.

As soon as the "Alert" was moored at the Marine Department wharf, I requested Mr. W. M. Smith, Chief Inspector of Machinery for the Dominion, to examine the ship's engines and boilers and to order such repairs and renewals as he considered necessary to fit her for the voyage for which she was intended. After the repairs were made, Mr. Smith again inspected and tested the engines and boilers and reported them to be in good order.

The time from May 3rd to the 27th was spent in purchasing and getting on board all the necessary stores, coal, &c., the ship being provisioned on the basis of a crew of fifty for a voyage of four hundred days.

On May 27th, all the stores being on board and the members of the Expedition having joined, we sailed about 11 a.m., leaving the harbor in company with the D.S.S. "Lansdowne."

The following are the names and positions held by the members of the Expedition and Officers of the ship:—

Officers of the ship—Andrew Robertson Gordon, commanding Dominion steamship "Alert," Hudson's Bay Expedition; John James Barrie, first officer; Edward Watts, second officer; David Mooney, chief engineer; W. F. Esdaile, second engineer; W. F. Yeadon, carpenter.

The crew consisted of—2 boatswains, 12 able seamen, 1 lamp trimmer, 6 engineers' crew, 1 chief steward, 1 chief cook, 2 assistant stewards, 1 assistant cook.

The members of the Expedition were—Dr. R. Bell, F.R.S.C., medical officer, geologist, &c.; Mr. James McNaughton, assistant geologist; Mr. Frank F. Payne, Mr. James Tyrell, Mr. John McKenzie, Mr. Percy Woodworth and Mr. Gilbert Shaw, observers.

Station hands—Télesphore Mercier, John Mercier, William Mills, D. Creelman, Robert Yeadon, Albert Boutillier, Frank Paul, Maurice Fleming, G. P. Gooley, A. R. Bissette, J. R. Bowditch, William Smith.

Besides the above mentioned, Mr. D. G. Beaton, editor of the Winnipeg *Times*, accompanied the Expedition as the representative of the company who are interested in the construction of the railway from Winnipeg to Hudson's Bay, making a total of fifty-two persons in all on board at the date of sailing.

All officers and men who were engaged for the Expedition were carefully examined, as to their physical fitness for the work, by Dr. Wickwire, of Halifax, and passed as being in sound health, and of such a vigorous constitution as to be able to withstand the rigors of an Arctic climate.

In regard to the maintenance of discipline, all signed articles under the Canadian Government Vessels Discipline Act, those appointed as station hands signing a special agreement that the Act should be held to be in force in regard to them while ashore at their observing stations, in the same way as on board the ship.

THE VOYAGE.

On getting clear of Halifax harbor, about noon on the 27th, shaped course to the N.E., and steamed along the Nova Scotian coast, passing Scattari Island light at 1 a.m. of the 29th. On 30th May, when off Bay of Islands, about 8:15 p.m., we met a large and apparently compact body of field ice. I steamed to the westward, coasting this pack; and at 9:15 p.m., as it was then nearly dark, I decided to lie off for the night. At 4 a.m. on the 31st started the engines and proceeded to the westward, coasting the edge of the pack; and at 5 a.m., seeing that the ice seemed to extend to the south of west, took the pack, working through to the N.W. This ice was very close, but it was small, and much honeycombed, so that I was able to force the ship through without much difficulty, except on one or two occasions, when it was a little tighter than usual. At 4 p.m. got clear of the pack, having forced through between 35 and 40 miles of ice. I now shaped course for Greenly Island.

On the morning of 1st June I went into Blanc Sablon Bay to fill up with coal and water. I purchased 25 tons of coal from Job Bros & Co., who have a large fishing station here. The wind now set in fresh from the eastward. A good deal of ice came in, passing to the westward through the Straits, and it would have been waste of fuel to go out. I therefore remained here until 4 a.m. of the 4th, when the wind hauled out to the northward. We steamed to the westward under the north shore, finding a steadily widening field of ice, from Point Amour westward, and which filled the whole channel between Chateau Bay and Belle Isle with a tight pack of ice. Close in under the island (Belle Isle) was a narrow streak of open water through which we made our way, and passing close around the north end of the island we headed out through the pack to the eastward. The ice was very heavy, but not very tight together, so that we made good way through it, as long as daylight lasted. As soon as night set in I stopped the engines, and putting the ship under topsails and jib, kept her headed out to the eastward. At daylight on the 5th (2:45 a.m.) started the engines again, and open water being visible from the masthead, headed the ship for it, and got clear of the pack at 3:15 a.m.

5th June.—The edge of the ice at first ran about E.S.E., but at 4:40 a.m. we arrived at its eastern limit and were able to head up to N.N.E. On this course we again made the ice during the day, but whenever ice was reported ahead, the course was altered as necessary to keep the ship on the outer edge of the pack.

There was now lying between us and the Labrador coast about fifty miles of tight and heavy ice and large numbers of icebergs both interspersed through the pack and in the open water to the eastward.

6th June.—Shortly before midnight of the 5th, a dense fog set in which compelled me to take in all canvas and work the engines easy. About 8 a.m. the fog cleared away; took the pack and steamed away to the N.E. all day through heavy ice, which was in some places very closely packed, and in others contained lakes of

open water. At 10:30 p.m. the ice was so close and heavy that I stopped the engines for the night.

7th June.—At 1:30 a.m. the wind veered to E.N.E., and the ice slacked off; started the engines and worked the ship to E.N.E., through heavy slack ice and at 9:30 a.m. got clear, shaped course N. by E. ½ E., wind blowing fresh and squally.

8th June.—Wind continued increase during the day, and at 6:30 p.m. was blowing a strong gale from the N.E., the ship lying to under fore-and-aft canvas and easy steam, with a very heavy and confused sea running, and the ship laboring a good deal. On the morning of the 9th, the wind moderated and I stood in towards the land, but shortly before midnight made the ice again and stood off. On the morning of the 10th we had heavy showers of snow, and in the afternoon a fresh gale from the N.W. with a heavy sea. On the 11th we were coasting the ice pack, with numerous large icebergs in sight. At one time thirty of these were in sight. About 9 p.m. of the 12th we were in Lat. 59° N., abreast of the mouth of Nachvak Bay, where station No. 2 had been established in the season of 1884. I headed the ship direct in for the land, which was distinctly visible, and taking the pack at once steamed in till 10:30, when we found the ice so tight and heavy that it was impossible to force the ship any farther to the west. I therefore headed her out to the eastward, and getting clear of the pack, proceeded to the northward.

On June 15th, at 5 p.m. made the edge of the ice about 35 miles east of Cape Resolution, the ice, though heavy, was slack; steamed in, working as near course as possible. At 1:30 a.m. of the 16th made the land—Cape Best. The ice was now run tight together, so we banked the fires and left the ship to pull under a foretopsail and F. T. staysail. To-day sounded at 10 a.m. no bottom at 120 fathoms, temperature at the surface 29°. 9, at 120 fathoms 32°. At 6 p.m. the ice set solid to the ship fore and aft, rafting and piling up all round. On the 17th it was reported to me that the iron stem plate had been broken off some distance below the water. This was a most serious injury, as I dare not drive the ship at all hard through the ice, but as the stem was still covered with boiler-plate sheathing, I thought it possible that we might with care still carry out the voyage. From June 15th to July 6th we were drifting with the ice. At times the ice would run abroad and then the ship was worked under steam or sail, in whatever direction seemed most promising. I append hereto a chart on an enlarged scale, showing approximately our drift in the ice.

We got up steam in one boiler at 6 p.m. on July 6th, and worked the ship steadily out to the eastward, and at 1:50 p.m. on the 8th, having made upwards of a hundred miles to the eastward, got clear of the ice and shaped course to the southward.

The voyage from the Straits to St. Johns, Nfld., occupied seven days, as we were delayed a good deal by fog, but we arrived at St. Johns on the evening of the 15th, and I immediately made arrangements to have the ship put in dry dock and for the forging of a new stem plate. All the repairs were satisfactorily accomplished, and on the evening of the 27th, having taken in a supply of coal, fresh provisions, &c., weighed and proceeded for Hudson's Straits.

Leaving St. Johns as before stated on the evening of the 27th July, we had fine weather and no delay from either fog or ice until arriving off Cape Mugford; here we met the ice again, but it was sufficiently open to steam through without difficulty. At 8:45 p.m. on August the 1st, we anchored in Skynner's Cove, Nachvak Bay, and found that the observers were all well and had passed a very pleasant winter.

On August 2nd, got under way and proceeded for Cape Chudleigh Station (Port Burwell). I took Mr. Skynner on board at Nachvak, leaving his two assistants, Messrs. Jordan and Rainsford, to carry on the work during the summer.

We found scattered ice all the way from Nachvak to the Straits, but at 4 a.m., when off Cape Chudleigh, found the ice run tight together; it now shut down dense fog, which, however, cleared off about 9:30 a.m., the ship had meanwhile got fast in the pack and we were carried nearly through Gray Strait by the tide when still fast, then back again for about six miles, but when the tide was about half ebb the ice slacked off and we were able to steam to the westward. Dense fog again set in

just before we were clear of the Strait, I therefore steamed N. W. (mag.) and lay to in the ice for the night.

On the following morning, August the 4th, observed a vessel in the ice in the Straits, supposed to be the Hudson's Bay Company's ship *Diana*, bound for Fort Chimo. The ice was so thick around the shore that it was with difficulty we were able to work our way into the harbour (Port Burwell), and when in there the ice was jammed so tightly that I walked from the ship to the shore without difficulty.

I found Mr. Burwell and his two assistants well, and they reported having spent a pleasant winter ; that the house had been comfortably warm, and the supply of provisions ample and of good quality.

Owing to the impossibility of landing stores over the rough ice which filled the harbour, I arranged to leave Mr. Burwell and his men to continue the work of observing until the return voyage, and on the following morning (August 5th) got the anchor up at 6 a.m. and proceeded for Ashe Inlet.

I had concluded to make for Ashe Inlet, as our experience last year was that the north shore of the Straits was clear of ice before the south, and this was in accord with what the prevailing direction of the wind would indicate as being the probable movement of the ice. Outside the harbour we found the ice heavy, but fairly open for the first ten or fifteen miles, after which we found it tightly jammed and very heavy. At 10:50 a.m. I stopped the engines as we could not make any way through it, as the ice opened in leads from time to time, went ahead making nearly north, true, but not averaging on the whole much more than one and a half knots per hour up to midnight.

All day of the 6th met large quantities of ice, some of it very heavy, but as opportunity offered, worked the ship to the westward ; made from noon of the 6th to noon of the 7th about 37 miles, nearly all which was made on the afternoon of the 6th. A little before noon of the 7th the ice ran abroad a little, and we were able to work through at about four knots an hour. During the afternoon we passed the Hudson's Bay Company's two ships, the "Princess Royal" (barque) and the "Cam Owen" (brigantine). We exchanged numbers with the "Princess Royal" and steamed up close to the "Cam Owen" and spoke to Captain Hawes. The latter vessel had been moored to a heavy ice-pan for several days, waiting for her consort to come up.

All of the 8th and up to 6 p.m. of the 9th the ship was jammed, but from this time up to midnight the ice ran abroad a little, and we made about 12 miles to the westward, but the ice closing in at midnight, the ship was again fast, and remained so up to 8 a.m. of the 11th. At this time the ice ran abroad, and at 2 p.m., having made about 22 miles to W.N.W., we were clear of the body of the ice. The weather was now very thick, but, as the ice was very much scattered, we had no difficulty in making our course.

On the morning of the 12th we were lying about 12 miles off the shore and just to the south of the entrance to Ashe Inlet, with clear water to the south of us, but between us and the shore a tight jam of ice. I steamed along the edge of the ice for some distance, and finally decided to try and force the ship in, but at 7 a.m. the ship was tightly jammed about 7 miles off shore. About 11 a.m. the ice slacked off a little, and I went ahead again with the engines. We succeeded in forcing our way in to within about 2 miles of the harbor, when the propeller struck a piece of ice and one of the blades was broken off. Got the screw on deck and attached a new blade, but by the time the work was finished (7 p.m.) the ship was beset, and was being carried to the westward. From this date up to August 21st we were either fast in the ice or working through, endeavoring to get up to Ashe Inlet. On the 17th we got within half a mile of the entrance to the harbor, and Mr. Ashe's two assistants came off to the ship over the ice. They reported Mr. Ashe sick, having, as they thought, sprained his wrist. I still hoped to make the harbor, but by the following morning the ship had been carried far to the westward, and on the 21st, when I gave up the attempt, the ship was between 40 and 50 miles to the westward of the Inlet. At 3:30 a.m. on this day I started the engines and at 7:45 p.m. got

clear of the south edge of the ice. I estimated that we had made about 25 miles from the land to the edge of the pack. At midnight stopped the engines to wait for day light, before making the land on the south shore.

At noon of the 22nd arrived and anchored in Stupart's Bay. We had not passed any ice after 9 p.m. the previous evening, nor was there a single particle visible all along the south coast.

I found here letters from Mr. Stupart stating that, in consequence of famine among the natives, he had been obliged to give them some of his provisions, and that, as the ship was later than he expected in arriving, he had thought it best to leave for Fort Chimo in his boat. As he stated that both he and his men were in excellent health, and as I was aware that he was an experienced boat sailor, I concluded not to go in search of them, but to go on with the voyage. Immediately after the anchor was down we proceeded with the work of landing the stores for Mr. F. F. Payne and party. I may here state the stations to which the officers and men were detailed for the year 1885-86.

Station.	Observer.	Station Hands.
No. 1, Cape Chudleigh......	G. R. Shaw...............	Telesphore Mercier. John Mercier.
No. 2, Skynner's Cove.....	abolished.	
No. 3 Ashe Inlet..........	J. W. Tyrell, D. L. S......	D. Creelman. William Mills.
No. 4, Stupart's Bay.......	F. F. Payne..............	Albert Boutillier. Frank Paul.
No. 5, Nottingham's Island	John McKenzie............	Maurice Fleming. G. P. Gooley.
No. 6, Cape Digges.......	Percy Woodworth.........	A. R. Bissette. J. Bowditch.

At 6 p. m. all the stores, coal, etc., having been landed, we weighed and proceeded for Nottingham Island, where we arrived at noon on Monday, 24th, having encountered no ice whatever on the passage. At this station I regret to have to report the death of one of the station hands, A. D. Inglis, of Halifax. Assisted by Dr. Bell, I separately examined both Mr. De Boucherville and Mr. W. F. Esdaile, the surviving station hand. The examination showed clearly to my mind that the man had died from scurvy, brought on by neglect of the precautions mentioned in the printed instructions· The following is Dr. Bell's report on the case:—

"SS. 'Alert,' Hudson's Straits, August 24th, 1885.

"To Capt. A. R. Gordon,
"Commanding H. B. Expedition.

"Sir,—Having asked me to give you my opinion of the cause of the death of station man, A. D. Inglis, which we heard of to-day on our arrival at Nottingham Island, I beg to hand you the following statement:

"Mr. Inglis was left at the station in charge of Mr. De Boucherville in August, 1884; the other station man was Mr. W. Esdaile. The two survivors came on board the ship this afternoon, having been relieved by a new party whose stores have just been put ashore. Soon after Messrs De Boucherville and Esdaile reached the "Alert," we called them into your cabin separately, and in your presence I examined them successively in regard to the illness and death of Inglis, questioning them very fully as to all the circumstances, signs and symptoms of his disease, and on the means which had been employed in the treatment of it. In this way we

obtained a complete history of the whole case. Immediately on Mr. De Boucherville's retiring from the cabin, Mr. Esdaile was summoned and requested to give his account of the case, and to answer a great variety of questions similar to those which had just been put to the former.

"The result, as you are aware, was a complete agreement of the two, and from their statements I have no doubt that the unfortunate men died from scurvy. In describing the case they mentioned nearly all the features which are usually observed in the common form of this disease, as met with on land. I was satisfied, and I think you were also, that the deceased had been kindly and assiduously cared for by Messrs. DeBoucherville and Esdaile, and that no blame can attach to either of them on account of this sad occurrence. As you have requested Mr. DeBoucherville to make a written statement of the case as just related by himself, I need not here report his account of it.

"I have the honor to be, Sir,

"Your obedient servant,

"ROBERT BELL, M.D.,

"*Medical Officer, Hudson's Bay Expedition.*"

The report by Mr. C. V. DeBoucherville states that the unfortunate man spent the greater part of the time during the winter months lying in his bed, and that he was unable to induce him either to take sufficient exercise or to partake of such variety of food as had been recommended by the doctor, and in his examination he stated distinctly that Inglis had not taken his lime juice, as required by the instructions.

It is a noticeable fact that both cases of scurvy which occurred this year were those in which the sufferers had neglected to take the lime juice regularly.

Immediately after the anchor was let go, the work of landing the stores and provisions was commenced, and at 8 p.m. we left for Cape Digges, having landed Mr. McKenzie and his two men and all the necessary fuel and stores. We lay to in the Straits that night and at 10 a.m. on the morning of the 25th anchored in the harbor at Cape Digges, were we found Mr. Laperrière and his men in excellent health, and reporting that they had spent a very pleasant and comfortable winter. I remained in this harbor, shifting coal and taking in ballast till the evening of the 28th, when we sailed for Churchill. Passing to the east of Mansfield Island I took a line of soundings all the way across the bay. We made Knightshill Beacon at 8 a.m. of the 31st, and anchored in Churchill harbor at 2 p.m. the same day; when we found that the Hudson's Bay Company's ship the "Cam Owen" which we had passed in the ice on the 7th of the month, had arrived here two days ahead of us.

I examined the meteorological instruments used here and got all the returns from Mr. Spencer. He reported that last spring had been exceptionally late in regard to the movement of the ice, but that the winter had not been a severe one.

From the 31st August to the 7th September, we remained in Churchill, the weather being very bad ; it blew a gale almost continuously from the night of the 31st to the evening of the 6th. On some of the days it was impossible to communicate with the shore. I put up a tide gauge here and had continuous observations taken. I found the rise and fall of the Hudson's Bay Company's wharf to be between 9 and 10 feet, and the velocity of the current at the anchorage at half ebb to be five and a half knots, in the narrows at the entrance of the harbor it runs more rapidly. I estimate the maximum velocity at this point to be about eight knots.

On the morning of the 7th we left Churchill and shaped course across the bay for the North Sleepers, Dr. Bell being anxious to examine their geological formation, and as I wished to test the accuracy of their position as laid down on the chart. On the run eastward a regular series of soundings was taken, the lead being run down every four hours.

We had fine weather all the way across, and made the Sleepers on the afternoon of the 10th, but as the wind freshened so much that we could not have landed from the

boats, I stood out to sea for the night; the following morning (11th) Dr. Bell and his assistant were landed on one of the islands, and I obtained good observations for position. I also made a running survey of the western side of the most northerly portion of this group of islands, and named the islands after those gentlemen who had so generously contributed to Mission Work in Hudson's Bay.

On the following afternoon (12th Sept.) at 6 p.m. we arrived in Port Laperriere, Cape Digges. The 14th, 15th and 16th were spent in shifting coal and taking in ballast and water. On the 13th and 14th it blew a strong gale from the N.E., and on the 15th it continued to blow fresh though not amounting to a gale.

On the morning of the 13th Dr. Bell and party went over in one of the whale boats to the mainland, and the continued blow prevented their getting back to the ship till the evening of the 17th, when I picked them up at sea. At 7 a.m. we arrived off the entrance of Port DeBoucherville, Nottingham Island, and sent the boats in with some additional supplies for the station there. At 8:30 the boats having returned, left Nottingham Island for Ashe Inlet. We made an excellent run to the Inlet, arriving there at 9 on the following morning.

No field ice was met with except a few scattered pans lying off the S.E. end of Salisbury Island; there were, however, quite a number of icebergs, sometimes eight or ten being in sight at one time.

We anchored in Ashe Inlet at 9 a.m., and proceeded at once with the work of landing stores and provisions. Mr. Ashe, the observer in charge, was found to be suffering from an attack of scurvy. He was unable to walk at first, but after coming on board and receiving medical treatment he improved rapidly. Mr. Tyrell and his two assistants were landed here, and at 5 p.m. all stores, provisions, &c., being ashore, weighed and proceeded for Stupart's Bay, where we arrived and anchored at noon on Sunday, the 20th September. On entering the bay the ship touched the bottom aft, but she came off at once without any damage.

The weather was now very threatening in appearance. I, therefore, on the morning of the 21st, shifted berth farther out and at 4 p.m. let go a second anchor. All night of the 21st, the whole of the 22nd, and the morning of the 23rd, it blew a strong gale from the S.E., E. and N.E., with a heavy sea rolling into the harbor. At night on the 23rd the wind went down, and everything for the station having been landed, I left at 5.30 a.m. of the 24th. From this date up to the 29th we had almost continuously, heavy gales accompanied by blinding snow. After 8 a.m. of the 25th I laid the ship to, first on one tack and then on the other, and drifted out of the Straits. On the night of the 28th the wind moderated and I steamed round to the northward of the Buttons, and arrived at Port Burwell at 8 a.m. of the 29th.

The weather had now every appearance of a coming storm, but during the day the wind continued light and we were able to land all the provisions and stores for the station. At 10 p.m. let go the starboard anchor, the wind having increased to a gale from S.W., a heavy sea was coming into the harbor, and the ship rolling and laboring heavily. At 4 a.m. of the 30th it was blowing almost a hurricane and the ship was laboring much, with a very heavy sea breaking on the shore astern. I therefore got steam up and had the engines ready for instant use. At 7 a.m. found the ship dragging, went ahead with engines, and weighed starboard anchor, when we found that it was foul and had not been holding. As soon as it was cleared I let it go again, and then weighed the port anchor, which was found to have been broken short off at the crown, both flukes being gone; the bower chain was then shackled on to the sheet anchor, which was let go. The gale continued up to the afternoon of the 1st. On the 2nd and 3rd all hands were employed in getting ballast and water, and shifting coal, but on the 4th, 5th and 6th it was again blowing a gale from the eastward. On the morning of the 7th the wind had moderated, and at 1 p.m. we left for Nachvak, where we arrived at 11 a.m. on the following day.

At Nachvak I received letters from Mr. R. F. Stupart, informing me of his safe arrival at Fort Chimo, and that he had gone down the Labrador coast in the Hudson Bay Company's steamer "Labrador."

As it was not the intention of the Department to continue the station at this point for another year, I took Messrs. Jordan and Rainsford on board, together with all their instruments and unused provisions, and at 5:30 p.m. left Nachvak homeward bound.

The 8th, 9th and 10th were fine days, but on the 11th we had a heavy N.E. gale and a blinding snowstorm, and at 4:30 p.m. the ship was lying to under storm mizen and reefed main trysail; the sea was breaking over us a good deal, and I determined to try the effect of oil. I therefore placed a keg so that the oil should drip through a discharge pipe on the weather side. The effect of the oil was instantaneous, and in the thirty hours succeeding only two seas struck the ship. The total amount of oil consumed was about eighty gallons. One point which was most noticeable was that before using the oil the engine-room hatch and all hatches except the after companion and the scuttle under the topgallant forecastle were battened down, and the water was constantly washing about on the deck; afterwards we were able to open one light of the engine-room skylight, and the decks dried up except for the little water that washed up through the scuppers in the waist as the ship rolled.

At midnight on the 12th the gale had abated and sail was made on the ship, but the engines started at half speed only, as there were still frequent and heavy showers of passing snow.

On the 12th at 9.50 p.m. made Bacalieu Island light, and at 8 a.m. on the following morning we anchored in St. Johns, Newfoundland. I here purchased coal and filled up the water tanks, and leaving St. Johns at 3 a.m. on the 15th, arrived and anchored in Halifax harbor at 3 a.m. on the 18th. After daylight weighed and steamed into the Marine wharf and when the ship was secured, discharged ship's company and station hands of 1884-85.

ICE OBSERVATIONS.

In order that the range of the straits commanded by each station may be fully understood, I have described on the accompanying charts circles representing the horizon limit of the observation post at each station. In locating the observing stations I always had in view the obtaining, if possible, a comparatively sheltered spot for the erection of the dwelling house and then subsequently, selected the observation point from which the ice was to be watched.

The following are the heights of the observing points at the several stations:—

Station No. 1, Port Burwell, height, 250 feet, horizon distance, 18 miles.

Station No 2, Skynners Cove, height, 90 feet, horizon distance, 11 miles.

At this station observations were frequently made during the spring at altitudes of 400 and 500 feet, and on some occasions at upwards of 1,000 feet.

Station No. 3, Ashe Inlet, approximate height, 250 feet, horizon distance, 18 miles.

Occasionally observations were taken at a height of nearly 400 feet.

Station No. 4, Stupart's Bay, 350 feet, horizon distance, 22 miles.

Station No. 5, Nottingham Island, 120 feet, horizon distance, nearly 13 miles.

Station No. 6, Port Laperrière, about 250 feet, horizon distance, nearly 18 miles.

At this station observations were occasionally made at much greater heights.

PORT BURWELL.

Ice Record.

August, 1884.

Record begins on August 10th, when no ice was in sight.

On the 18th. A large iceberg drifted into the mouth of the harbor.

On the 23rd. Several icebergs.

On the 24th. Some of the bergs floated into the harbor and a few were still to be seen in the Straits.

On the 27th. A number of icebergs in the Straits.

On the 29th. The harbor was covered with a thin coating of ice in the early morning.

On 30th and 31st. A number of small icebergs in the Straits.

September, 1884.

On September 4th. No icebergs were in view, nor any seen again till the 9th, from which date to the 18th a number were observed each day, some moving down into McLelan Straits and others into Ungava Bay.

On the 19th and 20th. No ice in sight, but on the 21st a number of small bergs off the harbor and in the Straits.

Icebergs continued in sight up to the 25th, on which day Straits are reported clear.

On the 29th and 30th. A few bergs came in sight.

October, 1884.

October 1st. A few icebergs in sight which appear to move down into Ungava Bay. Icebergs in sight reported daily after this up to the 8th.

On the 3rd. The fresh water lakes were frozen, and on October 5th the first appearance of drift ice; this, however, in quite small fragments and passed away again.

On the 9th. Straits clear of ice.

10th. Two large bergs in sight.

11th, 12th, 13th. A few bergs in sight.

14th, 15th, 16th. Clear of ice.

On the 17th. Four large bergs.

18th. Clear.

19th, 20th and 21st. A few bergs in sight.

22nd. Drift ice and bergs visible in the Straits.

On the 24th. No ice in sight.

25th, 26th, 27th, 28th and 29th. A few icebergs in sight.

On the 29th. The harbor is nearly frozen over.

30th. No icebergs in the Straits, but a few to be seen in Ungava Bay.

31st. No icebergs in the Straits, but small fragments of drift ice collect in the harbor.

November, 1884.

November 1st. Harbor is completely frozen over, but no icebergs or drift ice in sight.

November 2nd. Harbor ice $1\frac{1}{2}$ inches thick, no icebergs in sight.

November 3rd. One iceberg and some drift ice in the Straits.

4th. Shore ice has formed for four or five miles out from the mouth of the harbor, a large belt of ice can be seen in the central part of the Straits extending as far as the eye could reach, the shore ice extends out four or five miles all the way along the coast.

November 5th. Straits contained a great quantity of ice. Ungava Bay is completely covered with ice as far as can be seen, but the ice both here and in the Straits is much broken up.

6th. Harbor ice is now 3 inches in thickness. Ice continues to collect in the Straits and the Bay is covered.

7th. Harbor ice is four inches thick, drift ice continues to collect.

8th. No open water to be seen, ice continues in Straits about 5 inches in thickness.

9th. Harbor ice 6 inches thick, no open water visible.

10th. Harbor ice 7 inches thick.

11th. Harbor ice 8 inches thick. The ice in the Straits is now very rough, being composed of masses of ice piled over each other in all manners of shapes. Some of the fresh water lakes have now ice eighteen inches in thickness.

12th. No open water, harbor ice 9½ inches thick.
13th do do 10 do
14th do do 10½ do
15th. No open water.
16th. No open water, harbor ice 11 inches thick.
17th do do 11½ do
18th. Harbor ice is now 12 inches thick, and the ice in the Straits is much broken up and drifts with the current in places.
19th. Harbor ice 12½ inches thick, Straits' ice much broken up.
22nd. Harbor ice 13 inches.
24th. Harbor ice 13½ inches. On this night a very heavy easterly gale set in and at night it reached the force of a hurricane, the anemometer though firmly secured in its place by heavy, coarse thread wood screws was blown down and the house was lifted from its foundations several times.
At 4 a.m. on the 25th the gale began to abate. Notwithstanding the severity of this gale the condition of the ice remained apparently unchanged.
26th. Harbor ice 14 inches, ice outside unchanged.
27th. do 15 do do
28th. do 15½ do
29th. do 16 do Ice outside very rough, some pieces standing up 8 or 10 feet above the average level.
30th. Straits' ice tightly jammed.

December, 1884.

1st, 2nd, 3rd, 4th, 5th, 6th. No change in ice reported.
7th. Harbor ice 19½ inches thick.
8th, 9th. No change reported.
10th. Ice in the Straits continues to jam and pile up, and is in the roughest conceivable condition. A few icebergs are visible dotted here and there in the field ice.
11th, 12th, 13th. No change.
14th. The ice in the Straits has all frozen together forming a solid mass of field ice, broken only in a few places where there is a current, in which place the ice moves with the tide.
15th, 16th, 17th, 18th, 19th. No change in ice reported.
20th. A narrow current seems to extend from the north along the coast down into Ungava Bay, in which the ice moves to and fro with the tide, and carrying with it large icebergs. All the rest of the ice appears to be stationary, sometimes the ice jams with very great force in this current, causing a roaring sound.
21st, 22nd, 23rd, 24th, 25th, 26th 27th 28th, 29th, 30th, 31st. No change in ice is reported.

January, 1885.

January 1st to 26th. No change.
On the 27th large clouds of vapor rise from the different cracks in the ice.
28th, 29th, 30th. No change reported.

February, 1885.

February 1st, 2nd, 3rd, 4th. No change in the appearance of the ice.
5th. A narrow belt of open water extends from the north down along the coast into Ungava Bay.
6th. The ice in the Straits begins to break up, large ponds of water being visible.
7th. A very great quantity of ice has drifted out of the Straits, there appears to be now as large a space of open water as there is of ice. A quantity of ice has also drifted out of Ungava Bay.

8th. The Straits are nearly clear of ice; Ungava Bay is also open, except a wide belt of ice extending along the coast.

9th, 10th, 11th. Same as 8th.

12th, 13th. Could not see the Straits on account of drifting snow.

14th. The Straits are again completely covered with ice, which is much broken up, and seems rougher than formerly.

15th. Large patches of open water in the Strait.

16th. No open water.

17th. A few patches of open water, some icebergs are interspersed through the pack, and the whole of the ice seems to be moving.

18th, 19th. No change reported.

20th. A large quantity of ice has gone out of the Straits.

21st. Much open water in Ungava Bay, but not much in the Straits.

22nd. No open water is visible, but the ice is all small and keeps moving.

23rd, 24th, 25th. Same as 22nd.

26th, 27th, 28th. A large body of open water is to be seen in the Straits and Ungava Bay.

March, 1885.

1st. No open water to be seen in the Straits.

2nd, 3rd. A few patches of open water.

4th, 5th. No open water to be seen in the Straits, though the whole body of the ice moves with the tide.

6th. No open water, ice is tightly jammed, and in some places is piled up to a great height.

7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th. No open water visible.

16th. The ice on the fresh water lakes is now 5 feet 7 inches thick. A large amount of open water is to be seen in the Straits.

17th, 18th, 19th. A good deal of open water visible.

20th, 21st, 22nd, 23rd, 24th. A small area of open water is to be seen in the Straits.

25th, 26th, 27th, 28th, 29th, 30th, 31st. No open water; ice keeps moving.

April, 1885.

1st. A small quantity of open water visible.

2nd, 3rd, 4th, 5th, 6th. No open water.

7th. A small quantity of open water.

8th. A great quantity of open water.

9th. Much open water.

10th. No ice in the Straits though there is an narrow belt along the coast.

11th. Straits clear of ice.

12th. Only a few fragments of ice in sight.

13th. A small quantity of ice.

14th, Straits completely covered with ice, as far as can be seen.

15th. No open water.

16th. A small quantity of open water.

17th, 18th, 19th. No open water.

20th. A small portion of open water.

21st, 22nd. No open water.

23rd, 24th. A great deal of open water.

25th, 26th. Ice much closed up, a small quantity of open water only to be seen.

27th, 28th, 29th. No open water.

30th. A large quantity of open water to be seen in the Straits. The ice appears in great confusion, pieces dashing against one another with great force.

May, 1885.

1st. A large quantity of open water to be seen in the Straits.

2nd. No ice in the Straits near the coast, but a large quantity is to be seen on the horizon to the west and south-west.

3rd. A large quantity of ice is still to be seen in the Straits, but it appears much scattered and broken.

4th. Only a small quantity of drift ice in the Straits.

5th, 6th, 7th, 8th. Much ice in the Straits to the north, but Ungava Bay is clear.

9th. A small quantity of ice in the middle of the Straits, none on the coast.

10th. A large quantity of ice and a number of icebergs in the Straits. The ice appears to be going out to sea.

11th. Foggy.

12th. A large quantityof ice in long narrow strips, with open water between.

13th. South-west gale.

14th. A great quantity of ice in the Straits and Ungava Bay. This ice is different from any that has been seen here before, consisting of large cakes of solid field ice floating loosely apart, it is not piled up, but smooth.

15th. Straits completely covered with ice.

16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th. Straits and Bay full of ice. No open water visible.

25th, 26th, 27th, 28th, 29th. A small quantity of open water.

30th. No open water visible.

31st. A small quantity of open water.

June, 1885.

June 1st. Open water in Ungava Bay, none in Straits.

2nd. A small quantity of open water in Bay and Straits.

3rd. A large quantity of open water in the Straits.

4th. Much open water.

5th, Not much ice in Straits, but a large quantity on the horizon in Ungava Bay.

6th, 7th. Only a small quantity of ice to be seen in the Bay and Straits.

8th, 9th, 10th, 11th. A large quantity of ice, but floats loosely.

12th. Only a small quantity of open water is to be seen in the Straits. Ice much broken up and appears to be moving out to sea.

13th. Straits are more open to-day.

14th. Straits completely covered as far as the eye can reach. Ice much broken up.

16th, 17th. A small quantity of open water is visible.

18th, 19th, 20th, 21st, 22nd. No open water.

23rd. 24th, 25th. A large quantity of open water is visible in the Straits and Bay.

26th, 27th, 28th, 29th. Straits completely covered with ice.

29th. The harbor ice is melted through in places.

30th. No open water. The ice gets darker in color and is broken up into smaller fragments than before.

July, 1885.

1st, 2nd, 3rd, 4th. No open water.

5th. A large quantity of open water to be seen in the Straits, none near the coast or in the Bay.

6th, 7th, 8th, 9th, 10th, 11th, 12th. No open water.

13th. A few patches of open water.

14th. No open water.

15th. A small quantity of open water.

16th, 17th, 18th, 19th. A great deal of open water shows up.

20th, 21st. The ice in the Straits gets less in quantity, is much broken up and scattered.

22nd. Only a small quantity of ice is visible in the Straits.

23rd, 24th. A large quantity of ice is to be seen, and it keeps moving in and out of the harbor with the tide.

25th. Only a small quantity of ice is to be seen.

26th. Some ice is to be seen.

27th. Some ice in the Straits, none in Ungava Bay.

28th, 29th, 30th, 31st. A large quantity of ice to be seen in the Straits, the ice in some places is in solid fields and in others is widely scattered.

August, 1885.

August 1st, 2nd. The Bay and Straits are again completely blocked, only as mall quantity of open water to be seen. The ice looks much cleaner than any that has been seen before.

3rd. A small quantity of open water in the Straits.

4th. Some open water along the coast; none in the middle of the Straits.

5th. A large quantity of the ice has drifted away.

6th, 7th. Much ice still remains in the Straits.

8th. Much ice in the Straits; none in Ungava Bay.

9th, 10th, 11th. Only a small quantity of ice to be seen.

12th. Straits completely covered with ice, only a few narrow belts of open water showing.

13th. More open water to be seen to-day than yesterday.

14th. Only a small quantity of ice to be seen in the Straits.

15th, 16th. A large floe of ice visible in the Straits.

17th, 18th, 19th. Ice still in the harbor; only a small quantity of ice to be seen in the Straits.

20th, 21st. No ice to be seen in the Straits.

22nd. A small quantity of ice visible in the Straits.

23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st. No ice.

SKYNNER'S COVE, STATION NO. 2.

Ice Record.

October and November, 1884.

October 10th. No ice from this date up to 14th November, when the cove is frozen over and the whole inlet covered with young ice.

November 18th. Ice 3 inches thick; this young ice comes in and goes out with the wind.

November 30th. Ice set, across the inlet.

December, 1884.

4th. Ice has made 5 miles out from east point of cove, and from this time forward remains fast.

January, 1884.

The thickness of ice half a mile out from station is 2 feet 2 inches.

17th. Unable to see anything out at sea, owing to fog bank hanging apparently over open water.

23rd. No ice visible out at sea.

26th. Observed field ice out at sea to-day for the first time; some open water still shows.

31st. Observed ice out to sea from West Hill (1,000 feet); ice extended as far as the eye could see.

February, 1884.

7th. Thickness of ice 3 feet 6 inches; temperature of water 28·5° Fahr.

8th. Fog hangs over ice outside.

9th. Ice set well out, some loose ice visible.

14th. Ice as far out to sea as can be seen.

17th. Ice for four miles out from shore, then clear water as far as can be seen from top of West Hill.

18th. From West Hill, ice out for 20 miles, then open water just visible.

23th, 24th, 25th, 26th. Ice outside as far as could be seen.

27th, 28th, Foggy.

March, 1885.

4th. No open water visible out at sea, day clear.

19th. Open water 1½ miles outside the Breaker.

26th. Loose ice and some open water showing about four miles miles out.

Note. The Breaker is a reef which lies about 2 miles outside the entrance of the Bay and the same distance from the south face of Mount Razorback.

April, 1885.

4th. Ice as far out as can be seen.

8th. Ice loose from the Breaker eastwards and seems to be drifting in and out.

14th. Ice loose about 100 yards inside the Breaker, and seems to drift in and out with the tide.

18th. Ice as far out to sea as the eye can reach from top to West Hill (1,000 feet).

19th. Open water from one mile east of S.E. point for 20 miles.

20th. Open water from Breaker eastwards for about 3 miles; outside that is loose ice.

22nd. Loose ice as far as can be seen from a spot between 300 and 400 feet high on the S.E. point of Inlet. Open water all closed in with the rising tide.

24th. No open water visible.

May, 1885.

On the 2nd strong west wind blows ice out of the mouth of Inlet, after this date it continues to swing off and on the coast, occasionally showing strip of open water five to ten miles in width, and then swinging back tight with no water visible.

June, 1885.

1st. Field ice outside blown off and apparently gone south.

10th. Climbed up 400 feet (estimated) on 2nd point east; looking S.E. there is loose ice as far as can be seen; looking east there is a considerable stretch of water widening till clear to the horizon in the N.E.

12th. Open water as far as horizon from anemometer tower (about 100 feet above M.S.L.) ice shows up on the horizon.

13th, 14th, 15th. Ice off the coast as far as the eye can reach, open water only near the shore.

16th. No open water visible.

17th, 18th. Same as 16th.

19th. Ice about one mile from the mouth of the Inlet. A few scattered pieces round the shore.

20th, 21st, 22nd. Ice swings off the coast and back again.

23rd. The Hudson's Bay Officer, Mr. Ford, who is a native of this coast, tells me there are three separate packs of ice recognized as having to pass down the coast each spring. The first is called "Kugiet," or loose ice; the second is in larger pieces and much discolored with sand and dirt, called "Anidlujack;" the third is clear blue and clean, and is called "Newlowjuck." The second batch of ice is the one with which the seals are got.

23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th. Ice still off the coast at varying distances.

July, 1885.

1st, 2nd, 3rd, 4th, 5th, 6th, 7th. Ice visible off the coast, and swinging with the tide at different distances off shore.

8th, 9th, 10th. No ice in sight out at sea. On the 10th the Inlet ice went out in a single pan, two miles across and about six miles long.

11th, 12th, 13th. No ice in sight.

14th. Large masses of ice ten miles out at sea.

15th. Ice visible about ten or eleven miles out.

17th, 18th, 19th. Dense fog.

20th. Field ice about four miles off the coast.

21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st. Field ice off the coasts at varying distances, sometimes close in and fills up Inlet, at other times only visible on the horizon.

August, 1885.

1st. Ice off about ten miles.

3rd. No ice visible outside, nor was any seen between this date and 9th October, on which day the station was abandoned.

ASHE INLET, STATION NO. 3.

Ice Record.

August, 1884.

25th to 31st. No ice visible in the Straits.

September, 1884.

Some icebergs were seen during the month but no field ice, except a few scattered pieces on the 8th.

October, 1884.

1st. Ice formed on sheltered parts of the Inlet.

2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th. A few icebergs in sight each day.

10th, 11th. No ice visible in the Straits.

12th. A few bergs seen to-day.

13th, 14th, 15th. No ice visible.

16th, 17th, 18th, 19th, 20th, 21st, 22nd. A few icebergs visible.

23rd, 24th. No ice.

25th. Very few icebergs visible.

November, 1884.

14th. A few icebergs and some field ice, Inlet frozen over with 3 inches of ice.
15th, 16th, 17th 18th. 19th, A few icebergs and loose field ice in sight all the time.
20th, 21st. Solid field ice as far out as can be seen.
22nd. Heavy field ice and some icebergs in sight.
23rd. Field ice carried off shore.
27th, 28th, 29th. A few bergs and much field ice in sight.
30th. Compact field ice as far out as can be seen.

December, 1884.

1st. Compact field ice extends to the horizon.
1st to 17th. Observer reports ice continues the same solid field extending to the horizon.

January, 1885.

6th. Field ice now very thick floating as before in one contin uous mass with very narrow and short channels along the shore or rarely in the midst of it with the wind off shore, there is a continuous channel between the field ice and the shore, thickness of ice in the Inlet 2 feet 3 inches.

February, 1885.

3rd. Occasional open channels along the shore with off shore wind, if the wind continues these sometimes attain a width of two miles. Ice in the Inlet is now 2 feet 9½ inches.

March, 1885.

4th. Field ice continues the same. Ice in Inlet 2 feet 10¼ inches.

April, 1885.

4th. Field ice continues the same as last month. Thickness of ice in Inlet, 3 feet 10 inches.
17th. Field ice in smaller detached pieces, with about 15 per cent. of open water amongst it. The continuous north-west wind has carried the field 7 miles off shore.
20th. From one to three miles of open water along shore.
21st. Cold weather; snow, and on shore, winds have made the ice increase in quantity, thin ice is forming between the pans.
23rd. A little ice is forming in the Straits.
25th. Ice is set in on this shore.
28th. Ice is beginning to open a little.

May, 1885.

3rd. Ice in Inlet 4 feet 3 inches thick, field ice same as last report.
4th. Water now shows on top of the ice in the Inlet.
5th. The field ice begins to look very sodden and dirty quite a number of spaces of open water of considerable extent appear.
6th. About 10 per cent. of open water shows ice tight in, on the shore.
8th. Ice the same with an open channel along the shore. Wind N. W.
15th. Ice tight against the shore.
23rd. Ice very open to the east of the Island with a good wide channel along this shore.

24th. To the east, as far as the horizon, there is almost perfectly open water continuing as a narrow belt along the shore to the westward, about one and a half to two miles in width.

25th. Wind having shifted to S. E. field ice is returning.

26th. Ice set tight against the shore with about 15 per cent. of open water showing to the eastward.

29th. Ice more off shore.

June, 1885.

1st. Ice still on shore but very dirty looking.

3rd. Thickness of ice in Inlet 4 feet $4\frac{1}{2}$ inches the ice is beginning to honeycomb.

4th to 7th, ice very compact on this shore.

9th. Ice still compact in Straits.

10th. N. W. wind, ice has opened off the shore leaving a channel three quarters of a mile wide all along the shore.

11th. Field ice much piled up one block on another, much open water to the east which however narrows down to about 4 miles, abreast of the station.

13th. Ice about one mile off shore.

14th. N. W. wind has carried the ice 10 miles off.

15th. Ice is heavily set in on this shore, but a number of narrow and disconnectedchannels show through it.

18th. There seems to be an almost continuous channel, from 1 to 2 miles wide and about 18 miles off shore between here and there the ice is tight.

21st. Open channel along the shore, no ice visible to S. E. and E.

23rd. Ice as before.

24th. Two whale boats of Eskimo came down from the trading station west of here (Capt. Nipkins).

25th. Ice distributed evenly as far as can be seen about 30 per cent of open water shows.

26th. Ice tight on this shore only 15 per cent of open water now visible.

28th. Ice very open to the south-east and well open to the south to-day and since the 26th a wide continuous channel has remained open near the horizon.

July, 1885.

1st. Open water still shows about 18 miles off shore, ice tight on the shore.

2nd. Thickness of ice in Inlet 3 ft. $3\frac{1}{2}$ inches field ice remains the same.

5th. Thickness of ice in Inlet 3 ft. $1\frac{1}{4}$ inches, ice continues tight one shore but very open to the east and south-east.

6th. Ice well out from shore. Ice in inlet now only 2 feet $3\frac{1}{2}$ inches thick.

7th. Ice only 2 feet thick in inlet. Field ice the same.

8th. Ice in inlet now 1 foot, $9\frac{1}{2}$ inches in thickness. Field ice the same as before with open water channel showing 18 miles off shore.

12th. Ice left the Inlet.

17th. Field ice tight on this shore.

18th. Ice about one mile off shore.

19th. Ice very open though close to shore.

22nd. Ice since 20th very close to shore, no open water visible.

23rd. Much field ice.

24th. To the east apparently unlimited open water.

25th. The ice from the Straits grounding in the Inlet, shows a thickness of 30 feet.

27th. No ice visible south-east of station. Large spaces of open water elsewhere.

28th. Ice set in from all directions on shore.

31st. Ice continues.

August, 1885.

4th. Eastern edge of field ice is now opposite east end of this Island. Channel of open water 15 miles off shore.

5th. Eastern edge of ice now opposite station. Channel now probably 10 miles wide.

12th. channel now about 10 miles out and in width continues beyond the horizon. No ice to the eastward. "Alert" appeared and broke her propeller trying to force her way through the belt of ice.

17th. Ice as before.

21st. North-west wind is now carrying the ice off shore.

30th. Field ice is all gone since the 21st, only a few straggling pieces have been seen.

September, 1885.

18th. No field ice has been seen since last report.

STUPART'S BAY, STATION NO. 4.

Ice Record.

August, 1884.

During the latter part of this month there was a small quantity of loose ice in the Straits.

September, 1884.

During the first week there was a little loose ice floating about but after the 8th, with the exception of a few bergs, there was no ice visible.

October, 1884.

Ice began to form in the Straits on the 22nd, and by the 28th was probably between 3 and 5 inches thick, with very little water in any direction.

November, 1884.

1st. Ice in Bay about 8 inches thick. For a distance of several miles from shore ice much broken, with a general movement to the south-east; further out it is much more compact.

15th. The ice which has covered Straits for past fortnight seems to have been carried to the south-east and packed in near shore. Water to east and north is now covered with much thinner ice; no really open water to be seen.

19th. Ice quite compact to northward. North-east a large patch of clear water on horizon. To eastward much open water for some miles out from shore, but none visible beyond.

21st. Ice still much broken and scattered; in fact there is now very little for some miles from shore. Ice blink along horizon except at one point to north, where it is doubtful whether there is any ice at all.

23rd. For several miles out very little ice, and in distance it seems much broken and scattered. To northward there is scarcely any.

26th. Ice in Straits much broken and scattered, especially to north-east and east, where there are mere patches of ice here and there.

28th. A patch of old heavy ice to northward; water beyond.

30th. Very little ice to be seen from look-out post to day; two or three patches to north and north-east, the rest is mere scum, clear water along the shore.

December, 1884.

2nd. To north and north-east, Straits covered with loosely packed ice east and south-east it is more scattered and open.

5th. To-day ice is compact for many miles out. To south-east there is no sign of open water but in other quarters the sky along the horizon has every appearance of open water.

7th. Ice in Straits generally compact, but to north and north-east there is some water visible and a sky which would seem to indicate open water.

10th. No water to be seen to-day. From appearance of sky would say there is open water to north, leading east, ice apparently very compact to the east and south-east.

13th. Weather thick, slight fog hanging over Straits. One lake visible to north-east otherwise as far as can be seen the ice except near shore closely packed.

18th. As far as can be seen ice quite compact to north-east and north, to east and south-east there is open water with very little loose scattered ice for some miles from shore. Beyond that a thick bank of fog.

22nd. Ice compact as far as eye can reach, except to eastward where it seems somewhat loose, but fog prevents our seeing any great distance in that direction.

28th. Slight fog over Straits as far as can be seen. Ice compact in all directions

31st. Thick over Straits but not as dense as yesterday. Can see much open water but there are numerous ice fields moving east and south-east.

January, 1885.

1st. Ice in Straits much broken and moving east and south-east; thick fog bank resting at a distance of a few miles, where there is, I think, quite open water, more especially to eastward. No fog over land or near shore, except over patches of water, from which a thick mist rises.

4th. This morning compact ice to north and north-east, a clear horizon; water from this point to east, north-east, away to horizon, and east and south-east dense fog bank in distance in these directions.

6th. Ice has closed down more to eastward but there is still open water to eastward and a dense fog bank.

8th. Ice has closed down to eastward and only a few patches of open water to be seen; fog on horizon; to north and north-east, ice compact, clear horizon.

12th. North of a line drawn eastward, from lookout station ice is compact, a clear horizon and no water. To southward apparently open water but cannot see far owing to fog.

14th. Ice compact between north and north-east, between north-east and south-east apparently open water; dense fog bank to eastward.

15th. Straits very much open to-day. To northward ice is loose, while at some distance out there is a fog bank apparently over water. Between north-east and south-east there is little or no ice to be seen.

16th. Ice for some miles out, but water all along the horizon, water is nearer land to eastward than to northward.

18th. Atmosphere is very thick, but should judge that open water is nearer shore than yesterday; to eastward it approaches almost the mouth of bay, but north-east and north there is still ice for some distance out.

21st. Straits completely packed; no water to be seen; fog bank along horizon from north to east.

22nd. Ice closely packed.

23rd. Morning, ice moving off shore, in afternoon strip of water about half a mile wide near shore.

25th. A line of water along horizon, north to north east, where a long patch of drift ice separates it from more open water, closer in shore; east and south-east it is well open with loose patches.

28th. A good deal of fog over Straits; ice rough and broken with long lanes of water running east and west. At one point to north-east, there appeared at 3 p. m. to be open water; at any rate could see no ice beyond. Too misty to see far.

29th. Thick fog north-east and east, northward a good deal of ice, but water along horizon, open close inshore.

February, 1885.

1st. No water to be seen to-day except patch at entrance to bay, ice compact in all directions, weather gloomy but no fog.

2nd. Ice compact in all directions. Ice in bay two hundred yards from low water mark, four feet thick.

4th. No water except close along shore. Ice near mouth of bay three feet six inches thick.

6th. Ice closely packed in all directions, no water to be seen except a small patch close inshore to northward.

8th. Ice more broken up near shore. Straits generally closely packed.

10th. Open water for some distance out from shore, ice beyond seems loose and much broken. Hazy over Straits, so could not obtain a clear view.

14th. A number of lakes of water in all directions, one large one to northward, the outer ice is apparently much more loosely packed to-day.

15th. Water along shore and to eastward for some miles out, ice all along horizon, weather quite clear.

17th. Many patches of water along shore; to north and north-east a very watery sky and dark horizon but cannot see the open water.

20th. Straits quite blocked, no water except close along shore.

21st. A dark watery horizon to eastward.

23rd. A dark watery sky north and north-east, but can see no water.

27th. Not particularly clear; ice compact in all directions.

March, 1885.

1st. Ice compact no water, fog bank on horizon to east north-east at noon.

5th. Lane of water about a half mile wide along shore, to north and north-east ice not so closely packed as for some time past, there being many small patches of water, no sign of water on horizon; weather clear.

7th. Lane of water near shore, to eastward thick fog; to north and north-east ice loose, fog on horizon. Ice in bay two hundred yards from low water mark four feet six inches thick.

9th. No open water in any direction.

15th. Ice opening in all directions, fog along horizon; to eastward large patches of water within a short distance of shore.

16th. Weather thick, cannot see far, many patches of water to east and south-east.

18th. Straits completely blocked in all directions.

23rd. Afternoon a strip of water widening out along shore with south and south-west winds; to eastward ice becoming very loose, to northward can see no water but dark horizon.

25th. Large patches of water visible in all directions more especially to north and north-east; cannot see over five or six miles. Porpoises seen near shore.

27th. To north and north-east water for some miles out and fog beyond; to eastward where there was water near shore yesterday there is now young ice sufficiently thick to bear a man; water on horizon.

28th. Much water to-day, especially north and south-east; ice much broken up and loose, water all along the horizon.

29th. From north to north-east, for say ten miles out, ice loose, with many long lanes of water, fog beyond; north-east to east-south-east water near shore, and beyond, a dense fog bank.

30th. A little more ice to northward than yesterday; very loose and broken to eastward, water sky all along horizon; water along shore.

31st. Ice a little more compact; water near shore, and a good many lanes and openings to eastward, fog along the horizon; ice in bay four feet nine and a half inches.

April, 1885.

1st. To north and north east round shore and for some few miles out, thin newly made ice, beyond this a long band of drift ice with several long lakes in it; water sky horizon; much open water to eastward as far as can be seen, but weather dull and hazy.

3rd. Ice by no means closely packed; many ponds and openings in all directions. Fog all along horizon.

4th. Water along shore increasing in width for many miles to eastward; only ice which has formed during past week. A clear ice horizon, except possibly at one point to N. N. E. and another E. N. E., where there may be water.

7th. Ice in all directions to-day; around shore not very compact, many small openings in newly made ice; fog along horizon.

12th. Thick and misty over Straits; to north and north-east ice, apparently close and compact. To eastward, at a distance of about five miles, water, but cannot see how far it extends. Strip of water running up bay.

14th. A little more water near mouth of bay, but ice generally close and compact in all directions; hazy on horizon, more especially to eastward.

15th. A few small patches of water around shore, otherwise ice compact.

17th. Ice compact in all directions.

21st. Morning. Except one or two small patches, close to shore, no water in any direction. Afternoon. Since last observation south-east wind has moved ice from shore. A band of water about a mile wide and still increasing all around shore. Ice, especially to eastward, loosening and many patches of water.

22nd. No water to be seen.

26th. Patch of water near mouth of bay, but ice in Straits generally compact; no sign of water on horizon.

27th. Band of water around shore; in afternoon ice looser.

29th. Band of water increased much north and north-east; ice looser in all directions.

May, 1885.

2nd. A dark horizon; fog north and east; no water near shore. Afternoon. A few patches of water near shore; a dark horizon, but can see no water.

8th. Morning, no water. 4 p. m. Great visibility; could see an immense distance over Straits, but no water. To northward a dark, cloudy appearance, almost looked like land on other side, perhaps mirage, but more likely reflection from water; sky overcast.

10th. Fog on horizon north and east; ice opening out from shore.

11th. Bank of fog along the horizon; ice in bay five feet five inches thick.

13th. Drifting heavily all day. 7 p. m. Band of water around shore; ice easing off fast; large rent in bay; ice east and south.

14th. 7:30 a. m. Belt of water along the shore and running to head of large bay; water on horizon to north-east; other directions can see no water, but weather hazy; ice loose north-east and east.

16th. Still a belt of water around shore, but not as much as yesterday; ice closing in again.

18th. No water.

19th. Ice much looser for some miles out from shore, with patches of water here and there; Ice thick along the horizon.

21st. Ice seems very loose for some distance from shore; many lanes and breaks east and south-east; open water for some miles from shore.

22nd. Patches of open water at mouth of bay; ice horizon.

23rd. Broad belt of open water around in morning; closed up again in afternoon; water sky horizon to north-east.

24th. Clear, ice horizon.

27th. No water to be seen.

31st. Narrow belt of water round shore.

June, 1885.

1st. Ice loose near shore, but a clear ice horizon.

3rd. Esquimaux report that from a hill some miles distant there is water to be seen to the north.

4th. Water round shore; water sky to northward 7:30 p.m. Ice loosening in all directions; large body of water to eastward increasing. To northward some miles off coast, water; I think a large amount, but weather thick; cannot see far; p.m. weather foggy.

6th. 7th, Foggy.

8th. Water sky horizon between north and east-north east.

9th. Dark horizon to north-east, ice opening out from shore.

10th. In evening dark fog bank on horizon to eastward.

11th, 7:30 a.m. A particularly clear horizon; south-east to north-east no sign of water, ice compact; north-east to north, ice on horizon loose. A long lane of water about eight miles out running east and west, patch of water at mouth of bay, otherwise none near shore 11:30 a.m., no change since last observation, very clear horizon 3:30 p.m. Still a clear horizon; north-east to north, ice still loose but no large patches of water, north-east to south-east ice compact.

12th. No water in any direction.

13th. Patch of water at mouth of bay, increasing in size, otherwise no water in any direction.

14th. No water except patch at mouth of bay; 11:30 a.m. From appearance of sky there is loose or moving ice east-north-east and north-east, and water beyond horizon to north-east; broad patch of water at mouth of bay and several small patches some distance from shore thick to northward, 3:30 p.m. Water horizon sky north and east, ice around shore much the same as last observation; 7:30 p.m. closed up at mouth of bay and round shore, water sky horizon; 11 p.m. very dark sky to east-south-east.

15th. Ice loose near shore; weather foggy.

18th. Fog all day 7:30 p.m. Open water north-east and east as far out as can be seen through fog. To northward water around shore extending out for two or three miles; ice to south-east of mouth of harbor loose and much broken up.

19th. Water and loose ice for some miles out from shore, beyond that there is ice; to north-east and east it is apparently looser than in the other directions.

20th. Ice loose and broken up in all directions except east, between east and north patches of water as far out as we can see, fog along horizon.

21st. Ice generally not so loose as yesterday, but still by no means compact. About eight miles out north north-east to east-north-east a long lane of water; dark watery horizon between north and east.

22nd. Scarcely any water but a water sky horizon at most points.

24th. To north and north-east ice around shore more loosely packed than for some days past, still a water sky horizon.

25th. Ice slackening off shore, and in the evening a water sky horizon.

29th, 7:30 a.m. Narrow strip of water along shore, very hazy north to east north-east. East north-east to south-east, not so thick; clear ice horizon; no water in any direction 11:30 a.m. Dark hazy horizon east to north, but with exception of bay no water visible, ice compact. 5:30 p.m., dark horizon all round to northward, very

hazy; to eastward, ice may be a trifle looser otherwise no change. 7:30 p.m., dark sky east and north-east, all other directions hazy.

30th. This evening, at 7:30, mirage showed considerable body of water from north-east by north, to east north-east; judge this roughly to be about thirty miles distant; water sky to north, and also to east.

July 1885.

1st. Mirage appearance; line of water with ice beyond, north-east to east, patch N. E. by N., cannot see ice beyond.

2nd, 3 p.m. Mirage N. N. E. to E. by N., not very distinct, but shows moving ice, with water beyond; from N.E. by E. to N.N.E. ice seems more open, and there is water around shore.

3rd, 7 p.m. Dark watery horizon all round, except north to north-east. I think water on horizon.

4th, 12:45 p.m. Mirage shows open water N.N.E. to E. N.E., looks very open and clear N.E. to E.N.E., ice loose for some miles from shore.

5th, 5 p.m. Mirage along horizon, except N, and S.E., most marked E.N.E. to E., where it appears as a large body of water not very far out.

6th. Ice slackening off shore in morning; in afternoon weather foggy.

7th, 12:45 p.m. Mirage now plainly visible on horizon, between N. and E. water and ice fields. 3.30 p.m., a few breaks visible at a considerable distance from shore; ice on horizon; N.N.E. seems loose.

8th. Ice moved off shore a couple of miles, and seems loose beyond to N.N.E; can see mirage of opposite shore, but thick fog hangs below and prevents seeing anything of ice condition.

9th, 7:30 a.m. The belt of water around the shore has widened very considerably, and beyond more especially between N.N.E. and E. the ice seems much looser; further out there is thick fog Between E. and S. E. the ice does not look as loose; but owing to fog cannot see far. 11.30 a.m., great change, the ice has moved off many miles, in fact to N.E can see no ice, and between N.E. and E. it is loose; fog prevents seeing far. East and S.E. there is ice, but even this seems loose. 7.30 p.m., ice closing in; dense fog over Straits; during lift in fog made out ice to northward to be loose, with numerous small openings for many miles out; same to eastward; fog along the horizon.

10th. Morning, inner edge of ice about two miles from shore; afternoon, ice closing inshore again; fog on horizon about ten miles distant.

11th. In afternoon no water to be seen in any direction; mirage of open water and ice between N.N.E. and N.E.

12th. No water to be seen in any direction, ice loose around shore. 3.30 p.m., ice moved off shore a little with falling tide.

13th. Thick fog nearly all day.

14th, 3:30 p.m. Between north and east ice has moved off shore six or seven miles; east to south-east less water. A very dark line, with overhanging cloud bank along horizon, north and east to east ice looks compact. 7.30 p.m., ice closing in again with rising tide. Strips of water to east about eight miles off. Ice in the distance north north-east and north-east, looks loose, dark sky along the horizon.

15th. Water increasing around shore to east and east south-east. Ice loose and broken up for some six or seven miles out. To north and N.N.E can see three small patches of water about eight miles out; horizon hazy; afternoon and evening dense fog.

16th. Ice slack near shore; weather generally foggy.

17th, 11:30 a.m. Seven or eight miles of water and loose ice round the shore between east and north; weather generally hazy and confused mirage.

18th. Dense fog over Straits, can see only a short distance, ice opening out at mouth of bay, open water round shore, dark fog bank north and east. 11:30 a.m. still foggy, open all round shore and as far as can be seen ice looks loose east and south-east. 8 p.m., can only see some four miles from shore, as far as that it is quite open, some few pieces of floating ice to south-east.

19th. Field of loose ice stretching to horizon north and N.N.E.; water with a little loose ice N.N.E to E.S E; ice E.S.E. to S.E, but weather thick. 11:30 a.m., little change since morning, field ice moving south-east. 3:30 p.m., can see no change, fog over Straits; cannot see much over five miles.

20th. Bank of fog along coast about eight miles off shore, all open within that. 11.30 a.m.. can see edge of ice under fog bank N. to E.N.E. E. to S.E. a little loose scattered ice, bay opening out. Noon, fog lifted for a short time, ice shows to E.N.E., but only loose and scattered. N.E. rather more ice with water beyond, very much blurred with mirage; fog to north.

21st, 7:30 a.m. Between north and N.E. eight or ten miles of water, beyond which is field of loose ice to horizon N.E. to S.E., many miles of water and very loose ice fields, beyond which is a fog bank; E. and S.E. confused mirage. In morning ice seemed more compact to northward.

22nd, 7:30 a.m. Open water N. to N.E., about seven miles from shore, beyond, loose scattered ice as far as horizon. In other directions water inshore with loose ice beyond and fog hanging over it. 11:30 a.m, very little ice to north; N.N.E. fog bank about ten miles from shore with edge of loose ice showing underneath. Around shore nothing but a few pieces of loose ice. 3:30 p.m., a line of loose ice with water beyond, N. to N.E about fourteen miles off. To N.E. all open; E. to S.E. a line of ice along horizon. Altogether what we can see is very loose and abroad. Very little ice N. to N.E. N.E to S.E. line of loose ice, cannot see beyond; mirage of opposite shore visible.

23rd. Scarcely any ice at all for ten or fifteen miles, beyond that it is scattered and loose with mist hanging over it between east and north. 11:30 a.m., little change, now no ice to northward, but mirage of water and ice, horizon hazy. 3:30 p.m., loose ice along horizon. Tremulous atmosphere and mirage make it impossible to see with any degree of certainty. 7:30 p.m., N. to N.N.E. a little loose ice on horizon. N.E. to E.S.E. can just see line of loose ice; S.E. ice loose and scattered.

24th, 7:30 a.m. Except some small loose scattered pieces around shoals, no ice is to be seen in any direction; thick horizon. 11:30, no change since last. 3:30, very thick, can only see a mile or so from shore; no ice. 7:30 p.m., dense fog six miles off, quite clear as far as that.

25th. Between N. and E. there is more loose ice than for some days past moving east, inner edge of field ice from five to eight miles distant. Between east and S.E. scarcely any ice is to be seen, slight fog in distance, water to north and more ice to N.E. E. and S.E. still scarcely any. 7:30 p.m., scarcely any change since p.m. No ice to speak of E. and S.E., fog in distance in other directions.

26th, 7:30 a.m. Can see a line of loose ice from N.E. to E.S.E., but too thick to see the extent. Can see nothing to north. 11:30, a good deal of loose ice about six or eight miles from shore, reaching from north to E.N.E and extending as far as horizon to N.E. by N. and E.N.E., open water beyond. All open to east. 5 p.m., a little ice to N.N.E. and N.E. Elsewhere all open, getting very foggy. 7:30 p.m., dense fog, can see no distance.

27th, 7.30 a.m. Fog bank some miles distant resting on Straits between east and north, a small amount of scattered ice between it and shore. 11:30 a.m., for ten or fifteen miles much loose ice, beyond that a fog bank. To E.S.E. many miles of clear water, in other directions very little. 3:30 p.m., loose ice floe to horizon in all directions moving eastward, clear horizon. 7:30 p.m., loose ice in all directions in shore and off shore, very hazy on horizon.

28th. A good deal of loose ice scattered over Straits, especially to north not much east, horizon hazy. 11:30 a.m., can see nothing of Straits, thick fog. 3:30 p.m., weather still thick.

29th, 7:30 a.m. Foggy over Straits between north and N. E. Cannot see more than a mile from shore, no ice N. E., and E. Can see three or four miles, loose ice as far as that; more ice E. and E. S. E., than in other directions. 10 a.m., occasionally during lifts in fog can see many miles, apparently not as much ice as for past few days. 3 p.m., and evening, dense fog over Straits.

30th. Loose ice scattered over Straits especially to northward, where it seems more compact and reaches to horizon, fog bank along horizon N.E. to E. Noon, very little ice now to north and a good deal to E. N.-E., but with open water beyond elsewhere it is loose and scattered, 3:30 p.m; not much change since last. 7:30 p.m., from N. to N.E. a little loose ice, water beyond, N.E. to E. very little ice, and E. to S.E. a good deal scattered ice. Can see about ten or twelve miles.

31st, 7.30 a.m. Can see about fifteen miles, very little ice in any direction, horizon foggy; weather became foggy shortly after 8 a.m., and continued so until evening.

August, 18ɛ5.

1st. Can only see for six or seven miles in any direction, within that very little ice to be seen. 11.30 a.m., a little loose scattered ice around coast with open water beyond; hazy horizon. 3:30 p.m., no change since last 7:30 p.m., a little loose ice in all directions, moving off coast.

2nd. A small amount of scattered ice in all directions. 11 a.m. Ice which has been around inshore to S.E., moving out into Straits, scattered ice in all directions. 2 p.m. Fog bank some miles out 7 p,m. Fog bank about four miles out.

3rd. Thick for over land and Straits 11.30 a.m. A little loose ice around shore, all open beyond, harbor full of ice 3:30 p.m., no change 7:30 p.m. Straits all open as far as we can see in any direction, a little loose ice around shore and in Bay.

4th. Scattered ice near shore and in large bay; none off shore N.E. to E.S.E., fog some fifteen miles out, 11 a.m.; thick fog, 3 p.m.; and all evening slight fog near shore, dense further out.

5th, 7:30 a.m. Thick fog over Straits. Noon, a little ice near shore, all open beyond, bay jammed. 3:30 p.m., and evening, thick fog over Straits; 3:30 p.m., quite clear. A very little loose ice near shore none off shore. 7:30 p.m. no change.

7th. A little loose ice, scattered near shore and in bay, otherwise none to be seen in Straits. In p.m. thick haze over water.

8th, 7:30 a.m. Fog bank a few miles from shore. 11:30 a.m. Can see mirage of loose ice on horizon to N.N.E., and also to E.N.E., and E., otherwise no ice to be seen, weather somewhat hazy. 3:30 p.m. Notice to be seen in any direction, hazy N.E., to E.N.E. 7:30 p.m. Dense fog bank about four miles out.

9th. No ice to be seen, hazy in p.m.

10th. Fog over Straits in early morning, no ice.

11th. do do do

12th. No ice, clear horizon.

13th. Weather thick, no ice.

NOTTINGHAM ISLAND, STATION No. 5.

ICE RECORD.

September, 1884.

1st. Closely packed ice extending across the Straits.

2nd. Ice moving with the tide, large field near Cape Digges, not much change in appearance from yesterday.

3rd. Bay to the south-west clear of ice, straits remaining in same condition as before.

4th. Heavy loose field ice in Straits.

5th. Straits comparatively clear.

6th. Large field of ice off Salisbury Island, elsewhere Straits clear.

7th. Foggy.

8th. Large field of ice near Salisbury Island extending over towards the south coast, another field is moving into the Straits from the Bay.

9th, 10th. Heavy loose ice in Straits.

11th. Ice much scattered but extends to the east as far as the eye can reach.

12th. Ice same as yesterday,

13th. Heavy loose ice in straits moving west.

14th. Straits clear of ice to the east, but to south-west of island it is closely packed.

15th, 16th. Ice moving east, pack is loose but extends in every direction.

17th. Ice has been driven south and is moving east closely packed, Straits comparatively clear.

18th. Straits clear save for some scattered pans.

19th, 20th. Straits nearly clear of ice but weather thick from time to time.

21st, 22nd, 23rd. Straits clear for navigation but scattered ice seems to come from the west and drift towards the south coast.

24th. Some large ice-bergs visible to the east of the island.

25th. Heavy ice densely packed to the south-east.

26th. Ice has moved east and is much scattered.

27th. Scattered ice to the eastward, large pan ice coming in from the westward and moving east.

29th. Harbor covered with tight sheet of ice, Straits to the eastward comparatively clear in a.m.; in p.m. a good deal of ice.

30th. Heavy pack of ice to south-west seems to be coming from west and is much heavier than usual.

October, 1884.

1st. Clear water in middle of Straits, heavy pack along the shore.

2nd. Straits full of ice as far as can be seen, no open water visible.

3rd. Ice loose body of pack has moved east.

4th. Fog bank to the south in a.m.; in p.m. cleared and showed heavy field of ice lying north and south to the east of the island, clear water to south-west.

5th. Snow storm; ice packed on the shores.

6th. Fog and snow.

7th. Snow in a.m.; in the afternoon loose drift ice all over the straits.

8th. Straits clear to south, heavy ice to west and north-west.

9th. Snowstorm.

10th. Straits clear (first observation since landing that ice has not been in sight somewhere).

11th. Ice near south coast of island moving from the west.

12th. Scattered ice moving eastward.

13th. Ice very compact to the eastward.

14th. Ice extends to the south and is very compact, clear water shows to the southeast.

15th. Snowstorm.

16th. Straits to the south of us clear of ice, but large fields still to the south of Salisbury Island.

17th. Fog.

18th. Snowstorm.

19th. Straits this a.m. have a wintry appearance, the field of ice seems to extend nearly over to Wolstenholme, a narrow streak of open water only, showing some distance off shore. Straits east of here are also packed as far as can be seen with the telescope.

20th. Ice in straits same as yesterday.

21st. Ice remains heavy to the south-west, but that to the eastward is moving east.

22nd. Much of the ice to the south-west has gone and there is now but little ice opposite the station, the ice still remains off Salisbury Island.

23rd. Large icebergs coming in from the westward and any amount of heavy field ice in every direction.
24th. Heavy ice closely packed in the Straits.
25th. Heavy ice moves east and young ice forms in the Straits.
26th. Straits opposite are frozen as far as can be seen.
27th, 28th, 29th, 30th. Ice solid and immovable extending in every direction.
31st. Ice east of here moving to north-east, ice to south remaing stationary.

November, 1884.

1st. The south side of the Straits seems lined with field ice from Cape Digges eastward. Some large icebergs in the middle of the Straits, but clear water to the eastward.
2nd. Snowing all day.
3rd. Heavy field ice up to within five miles of south point of this island, to the eastward one solid and continuous pack.
4th, 5th, 6th, 7th. Ice closely packed everywhere.
8th. Much of the ice seems to have moved eastward, open water shows some distance off shore.
9th. Straits clear of ice to south and east but the field ice off Salisbury Island is now moving west again.
10th. Heavy field ice is swinging with the tide.
11th. Ice has set fast—no water visible.
12th. Ice to the east very compact but to the south only a few large bergs are visible.
13th. Snowing.
14th. Small strip of open water close to shore, elsewhere ice is fast and close.
15th. Ice to the east solid and immovable, but a strip of open water five miles in width is along the shore.
16th. Mist on straits.
17th. Ice closely packed everywhere.
18th, 19th, 20th, 21st, 22nd, 23rd. Ice tight, except for a few hours on the 20th, when a little open water showed up along shore.
24th, 25th. Snowing.
26th. Hazy over Straits.
27th, 28th. Ice tightly packed.
29th. Ice has moved to the north-east, Straits comparatively clear.
30th. Ice working its way west again.

December, 1884.

1st. Heavy ice but loose with patches of water showing.
2nd, 3rd, 4th. Ice closely packed in every direction.
5th. Loose ice to the south-west closely packed to the eastward.
6th. Large strip of clear water some distance off shore, elsewhere ice tight but moves with the tide.
7th. Heavy ice in every direction with spots of open water.
8th. Heavy ice, no open water.
9th. Ice has moved southeast, some open water shows off the coast.
10th. Snowing.
11th. Straits completely blocked.
12th to 31st. Straits completely blocked.

January, 1885.

1st, 2nd, 3rd, 4th. Ice solid in every direction.
5th. Snowstorm.

6th, 7th, 8th, 9th, 10th, 11th. Heavy ice everywhere.

12th, 13th, 14th, 15th. Snowstorm and drift so that straits cannot be seen.

16th. Ice in every direction.

17th, 18th, 19th, 20th, 21st. Ice in every direction unmoved.

22nd. The ice field to the eastward has moved east leaving a space of open water running north and south for some distance, but the Straits to the south are completely blocked.

23rd, 24th. Ice close in every direction.

25th. Mist some distance off shore.

26th. Snowstorm and drift.

27th. Drifting snow.

28th. Ice packed closely in every direction.

29th, 30th, 31st. Straits completely blocked.

February, 1885.

1st, 2nd, 3rd, 4th. Ice packed solidly in every direction.

5th, 6th, 7th. Snowstorm and drift.

8th, 9th, 10th, 11th. Straits blocked with heavy ice.

12th. Snow drifting.

13th. Straits blocked as before.

14th. Snow drifting.

Straits blocked continuously from the 15th to the 28th of the month.

March, 1885.

1st, 2nd, 3rd. Ice solid in every direction.

4th, 5th. Snowstorm and drift.

6th. The Straits to the eastward is clear of the heavy ice and is now covered with a smooth sheet of young ice.

7th, 8th, 9th. Young ice remains to the east, south and west, heavy ice is packed as before.

10th. Heavy ice again moving up from the eastward, and that to the southward is moving off, the sheet of smooth young ice taking its place.

11th. The heavy ice from the eastward is now within a quarter of a mile of the shore, and seems to be working towards the southwest.

12th. Ice in much the same position as yesterday.

13th, 14th, 15th, 16th. Straits completely covered with heavy ice.

17th. Snowdrift.

18th. A belt of open water to thenorth east, heavy ice still solid to the south.

19th. Snow drifting.

20th. Ice to the eastward swings off and back with the tide.

21st. A small belt of open water about two miles off the coast to the east, elsewhere the ice is closely packed.

22nd. Masses of vapor rise from the belt of open water which renders it impossible to see any great distance to the eastward, but there is no change in the ice to the south.

23rd, 24th, 25th, 26th, 27th. Heavy ice closely packed in every direction.

April, 1885.

1st. Clear water shows to the east and northeast, but ice is closely packed to the south.

2nd. Ice from the south has moved east, clear water shows to southwest.

3rd, 4th. Snow drifting.

5th. Ice seems loose and a good deal broken up.

6th. Ice to the south is loose, but east of this seems very compact.

7th. Clear water to the eastward, heavy close ice to south and S.W. of station.

8th. Clear water remained all day to the east, but at night the ice seems to be returning; ice very compact in S.W.

9th. Only a small strip of open water now shows to the east of this, elsewhere the Straits are closely packed.

10th. No open water visible.

11th. Snow falling and drifting.

12th, 13th. Straits in every direction closely packed with heavy ice.

14th. Snow falling and drifting.

15th. Ice to south very compact, small amount of open water to **N.E.**

16th. Ice to south and west very compact, more open water shows to east, in which direction the ice seems to be moving.

17th. Ice same as yesterday.

18th. Snow drifting; cannot see any distance.

19th, 20th. Heavy closely packed ice in every direction.

21st. Patches of open water show up through the pack to-day.

22nd. Ice east of here swings out and back with the tide.

23rd, 24th. Heavy ice in every direction.

25th, 26th. Ice is moving eastward; the middle of the Strait seems clear of ice.

27th, 28th. Snow drifting.

29th. Strait completely covered with ice.

30th. Snow drifting.

May, 1885.

1st. Snow drifting.

2nd. Heavy ice, closely packed, with ice in every direction.

3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th. Heavy ice in every direction.

11th. Snow drifting, unable to see the Straits.

12th. Ice moving south; large sheet of open water east of this station.

13th. Open water to the east of this station, but the ice seems heavy and closely packed to the south.

14th. Same as 13th.

15th. Ice seems loose and a good deal broken up.

16th. East and south-east ice is closely packed, but some patches of open water show to the south.

17th. Ice close everywhere.

18th. Open water to the east, near the Island, and very little ice showing to the southward.

19th. Ice swings with the tide again.

20th. Ice to the south-east closely packed; open water between here and Salisbury Island.

21st. Ice has moved up to-day against the wind; clear water to the west of the station.

22nd. The clear water now extends about 10 miles to the east of the station, but the ice at that distance seems set solid, and the Strait completely blocked.

23rd. Strait covered in every direction with loose ice.

24th. Strait densely packed to south and east.

25th. 26th, 27th, Straits covered with closely packed ice.

28th. Open water for a short distance south; ice close to the east of this station.

29th, 30th. Straits completely blocked.

31st. Three or four small patches of open water near the station, elsewhere the ice is closely packed.

June, 1885.

1st, 2nd. Ice closely packed.

6th, 7th, 8th, 9th, 10th. Ice closely packed.

11th. Ice is moving east in a body; Straits open to south, but east of here the ice is closely packed.

12th, 13th. Straits open to south, heavy ice to the eastward.

14th. Ice has again come west, but there is still a small belt of open water to the south.

15th. Heavy ice in every direction, but some narrow belts of open water show up in places.

16th. Open water shows to both south and east, but heavy ice is still visible to the east beyond the open water.

17th. Heavy and closely packed ice to the south.

18th. Open water in a narrow belt to S. W.; elsewhere Straits full.

19th. Straits full of heavy ice, with small patches of open water showing here and there.

20th. No open water showing.

21st. Patches of open water in south and S. W., ice solid to the east.

22nd. Ice moving to eastward, open water shows to south and west in long belts of varying width.

23rd. The ice between here and Salisbury Island is moving west, it seems to extend to the mainland on the south side; and is closely packed.

24th. Large sheets of open water showing to south-west.

25th. S. W. of station clear water, no movement of the ice to eastward.

26th, 27th. Straits packed with ice, apparently all the way across.

28th, 29th. S. W. of station clear of ice, but much still remains to the east.

30th. Clear water to south and west, ice still extends to south of Salisbury Island.

July, 1885.

1st, 2nd. Straits to east of here are clear of ice, but ice now shows to S. W. and south.

3rd. Ice is moving down from Salisbury Island, and the field to the S. W. is moving up to eastward.

4th. Loose ice covers the whole Straits as far as can be seen to south and west, but open water shows beyond the ice to the eastward.

5th. Ice is loose and drifting to the eastward, clear water to S. W.

6th. Misty weather.

7th. The wind having shifted to N. E., ice from Salisbury Island is moving this way, it is however small and open.

8th, 9th. Straits covered with ice, somewhat scattered on the 8th, closing upon the afternoon of the 9th.

10th. Straits covered with tight fields of ice.

11th. S. W. wind seems to be driving the ice towards Salisbury Island, leaving open water to south; in the S. W. loose ice covers the Straits.

12th, 13th, 14th, 15th, 16th, 17th. Ice in large fields of varying compactness swings with the tide and wind on and off the shore, occasionally leaving some large belts of open water along the coast, and other clear spaces which apparently lie in an east and west direction, are sometimes observed to the south.

18th, 19th, 20th, 21st, 22nd. Ice is visible in every direction, but is loose and swings with the tide and wind.

23rd. Foggy weather.

24th, 25th, 26th. Loose ice in all directions.

27th, 28th. Ice is closely packed to the eastward and south.

29th. Foggy weather.

30th. Straits to the eastward completely covered with heavy closely packed ice.

31st. Foggy weather.

August, 1885.

1st, 2nd. Compact and heavy ice to the eastward.

3rd. Dense fog.

4th. Heavy ice is still visible to the eastward.

5th. Ice has all moved east towards Salisbury Island; Straits to south-west completely clear, and clear water extends some miles to the east of this station.

6th. Ice is still closely packed to the south of Salisbury Island, and seems to extend to the southward.

7th. Ice south of Salisbury Island is moving this way; elsewhere the Straits are completely clear.

8th, 9th, 10th. Clear water to south and west; but ice still to south of Salisbury Island.

11th, 12th. Foggy weather.

13th. No ice visible, and none was seen between this date and the 23rd, on which day the "Alert" arrived and the station was relieved.

PORT LAPERRIÈRE (CAPE DIGGES), STATION No. 6.

Ice Record.

October, 1884.

1st. Heavy ice both in bay and straits, with open water channel showing occasionally.

2nd, 3rd, 4th, 5th. Same as 1st.

6th. Foggy all day.

7th. Foggy.

8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th. No ice in sight.

19th. Heavy field ice in the Strait, four miles off coast.

20th. No ice in sight.

21st. Drift ice in the Straits all day as far as can be seen.

22nd. No open water visible in the Strait.

23rd. Same as 22nd.

24th. Bay, Straits and Harbor frozen solid with new formed ice.

25th, 26th, 27th, 28th, 29th, 30th, 31st. All the ice solid; no water to be seen in the Straits. The 23rd seems to have been the last day on which navigation would have been possible.

November, 1884.

1st, 2nd. No water visible.

3rd. Bay and Straits open again; ice seems to move north and south.

4th. Loose drift ice in Bay and Straits.

5th. No open water in Straits, and very little in bay.

6th, 7th, 8th, 9th. Large pan ice in bay and straits.

10th, 11th, 12th, 13th. No open water visible.

14th. A narrow neck of open water, about one-quarter of a mile wide, close to the Island.

15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th. No open water.

December, 1884.

No entries in page for remarks, Observer states that the ice was rigid during this month, that no open water was seen.

January, 1885.

No entries. Ice fast all the time, no open water visible.

February, 1885.

11th. No ice in the Bay all day to-day, a few pans in the Straits, no other ice visible.

12th. All the ice has come back, no open water visible.

March, 1885.

2nd. At midnight the ice on the Bay side parted from the Island and drifted away as solid field towards Mansfield Island. The Straits ice remained intact.

3rd. No ice in the bay. Straits' still compact.

4th. Bay ice returned and took its original place, Straits' ice still compact.

5th. Ice is compact everywhere and remained so to the end of the month.

April, 1885.

15th. At 3 p.m., the ice parted from the Island and left a narrow channel of open water a few hundred feet wide which closed up again about 7 p.m.

16th. No water visible.

17th. Narrow channel of open water on both sides of Island.

18th. Clear water for five or six miles from the Island.

19th. Ice closed on Straits' side, but still a narrow channel on Bay side.

20th. No open water visible.

21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th. No open water in the Straits, ice does not move.

28th. The Bay ice goes off with the tide a few miles and returns.

29th. At 10 a.m. the Bay ice drifted away and did not return; at 4 p.m., the Straits ice parted from the island and drifted off one-half mile and then returned.

30th. No ice in the Bay, but Straits still solid.

May, 1885.

1st, 10:30 p.m. All the ice on the Bay side has drifted back to the Island.

2nd. No open water visible anywhere.

3rd. No open water visible.

4th. Ice on Bay side drifts off and on, floe has broken into two pieces. In the Straits the ice moves half a mile off and then back again.

5th, 6th. Ice is now much broken both in Bay and Straits, very narrow channel of open water on Straits shore.

7th. Very little water in the Straits.

8th. No open water in the Straits, in the Bay the ice drifted out of sight and then back again to within a mile of the shore.

9th, 10th. No open water except narrow belt near Island on Straits' side.

11th. Channel on Straits side a mile wide.

12th. No regular channel open anywhere, but the ice is much broken up, and large pools of water show all through.

13th, 14th. Very little open water anywhere.

15th. Narrow channel in Straits from 5 p.m. to 8 p.m.

16th. No open water seen in the Straits.

17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th. No open water in Straits.

25th. A narrow streak of open water along the Straits shore.

26th. Ice in bay out of sight in a.m. came back within 7 or 8 miles in p m. In the straits, detached ice fields as far as can be seen.

27th, 28th, 29th, 30th, 31st. No water visible in the Straits.

June, 1885.

1st. In the straits the ice seems to be much broken up, large patches of open water showing all over.

2nd. Ice all broken into loose drift ice, about a quarter of the visible surface of the Straits is open water.

3rd. Foggy.

4th. No open water visible in the Straits.

5th. Ice tight still.

6th. Ice in Bay and Straits is now much broken and open, the waters seem quite navigable.

7th. About half the waters of the straits clear of ice.

9th. A channel 5 or 6 miles wide, free of ice, beyond that 3 or 4 large icebergs and broken ice.

10th. In the morning about one-fifth of the visible portion of the Straits is covered with drift ice; in p.m. none visible except one small iceberg.

11th. In a.m. no ice visible in the Straits, but by evening about two-thirds of the visible area was covered with ice.

12th. Ice has closed in, leaving only a channel of a couple of miles in width close to the shores of the Island.

13th, 14th. Only a comparatively narrow channel of open water near the Island to-day.

15th, 16th, 17th, 18th, 19th, 20th, 21st. No open water.

22nd. A narrow channel off the Island all day, which at night widened to about two miles.

23rd. Ice broken and loose for 4 or 5 miles, beyond that is tight.

24th. Streaks and patches of water showing all over.

25th, 26th. Ice compact, no water visible from here. From a point about 4 miles east on the top of a high bluff open water was visible east of Cape Wolstenholme.

27th, 28th. No open water visible.

29th, 30th. No open water visible.

July, 1885.

1st. On the Bay side the ice is packed close, but in the Straits there is a narrow channel of open water about three miles in width.

2nd. Still the same channel, but now only 2 miles wide, all beyond the ice is closely packed.

3rd, 4th, 5th. Same as 2nd, except that the channel of open water varies from $1\frac{1}{2}$ miles to $\frac{1}{2}$ mile.

6th. No open water visible.

7th. Climbed the highest spot on the Island, estimated 2,000 feet, no water visible in the bay except two or three small pools. In the Straits there is apparently a narrow channel off Nottingham Island, and a few pools in the centre of the Straits.

8th. No alteration, ice tight everywhere.

9th, 10th, 11th. Ice still remains solid.

12th. From the Island for five or six miles the ice is broken and drifting, beyond that the pack is close.

13th. Foggy.

14th. No open water in the Straits.

15th, 16th. Some long narrow strips of open water visible in the Straits.

17th, 18th, 19th, 20th. Very little ice visible in either Bay or Straits to-day and what is seen is small drifting ice.

21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th. Straits clear, a little ice still visible off Nottingham Island.

29th, 30th, 31st. Foggy.

August, 1885.

1st. Foggy.

2nd. No ice in sight.

3rd. A good deal of broken ice drifted to the shores, fog very thick.

4th. Weather thick, could not see any distance.
5th. Ice close in Straits in a.m., but in p.m. ice was broken and scattered.
6th, 7th, 8th, 9th, 10th. No ice in Straits.
11th. Foggy.
12th, 13th. A little drift ice, loose and scattered.
14th, 15th, 16th, 17th, 18th, 19th. No ice in sight.
20th. A little heavy ice in both Bay and Straits.
21st. A little ice in the Straits.
22nd, 23rd, 24th. No ice.
25th. Station relieved.

Ice met with on the Voyage of the "Alert."

In the foregoing pages the accounts given by the observers at the several stations of the formation and movements of the ice have been given. In the narrative portion of the report the ice met with by the "Alert" has also been recorded, but as it has not been described in detail I will here make some further remarks concerning it. Our observations show that during the first half of the month of June, a belt of ice, varying in width from 30 to 50 miles, extended the whole length of the Labrador coast, from Cape Chudleigh to Belle Isle. Off the entrance of Hudson's Straits at this time the field extended from 35 to 100 miles to the eastward of Resolution Island, and on the 16th of June when I endeavoured to enter the Straits the ship was beset in heavy ice about ten miles to the S.W. of Cape Best. This ice was very heavy and some of it in large sheets, but at the turn of the tide the pack generally slacked off a little when the ship was worked on under steam or sail as opportunity offered; this state of affairs continued until the 6th of July, when, owing to the damage done to the ship, we had to return to St. Johns. Except on one occasion no large amount of open water was seen from our masthead, the ice always seeming to be tight to the westward of the ship. I measured the thickness of many of the pans some were 22 feet, but the common kind was floe ice about 10 feet in thickness. On the 4th of August when we got back from St. Johns there was still a great deal of ice in the Straits and some of the pans were of great size many of them being over half a mile in length. There was at this time undoubtedly a run of clear water to the westward, had I taken a more southerly course; but, in the "Neptune," we had found, in 1884, that the ice all lay over on the south shore and this made me decide to try the north shore again this year.

The Hudson Bay officers who navigate the Straits state that the movements of the ice are both irregular and uncertain, that sometimes they find the north shore clear first, and the following voyage the position of affairs may be completely reversed. I consider that the ice met with in August this year was such that had I been simply endeavoring to force my way through the Straits I could have been clear with less than five days' detention, even taking the route which I did, and had I taken a more southerly course I should most likely have got through with a couple of days' delay.

No ice, other than a few bergs, was met with after leaving Stupart's Bay, on 22nd August.

In the "Alert" the height of the topmast head from the water line was 90 feet, which gives a horizon of almost eleven miles.

Notes on the Ice Movements in Hudson Bay and Straits, 1768-1769.

I am indebted for the following notes to the Rev. Abbé Verreau, taken from the manuscript journal, kept by Capt. Wm. Falconer, who was a sloop master in the Hudson Bay Company's service in the years 1768-69. Capt. Falconer states: "In the month of July, when the above Hudson Bay Company's ships commonly get their passage through the Strait outward bound, it is almost blocked with ice, some of which is aground in 100 fathoms of water,............and this with the large quantities

of floating ice makes the passage dangerous, and detains the ships, some years, till the latter end of August, before they get clear of the Straits."

The ice mentioned in the above quoted paragraph as being aground in 100 fathoms of water is undoubtedly intended to apply to icebergs, some of which I have myself seen aground in from 80 to 100 fathoms. On the north side of the Straits some of these large masses of ice getting aground at high water of spring tides will remain fast for weeks if they do not break up. Capt. Falconer states that the Bay was only navigable from the latter part of July to the middle of October. On 8th August, 1768, he reports heavy field ice off Severn House; yet on that particular year he states that the Hudson Bay ship from England arrived on 11th August, one of the early dates.

Capt. Falconer further gives his opinion as to the dangers off the mouth of the Nelson River, stating: "Nelson River entrance is so dangerous that no vessel cares to come near it."

Dobbs on Hudson Bay, 1744.

The author of the above quoted work was a firm believer in the existence of a practical North-West passage to the Pacific Ocean and was, of course, convinced of the feasibility of navigating Hudson Bay and Straits. He quotes from a journal kept by Capt. James, of the Hudson Bay Company's service, who wintered at Charlton Island in the southern part of James Bay, in 1632, as follows: "15th June, sea still frozen; 19th June, saw open water, but sea to the north full of floating ice till the 22nd of July.

I find also in this book a record that on the 1st October, 1741, the ice was fast for two miles from the shore at Fort Churchill. This, however, broke up again and continued to drift off and on.

Captain Hawes.

I asked Capt. Hawes, of the Hudson Bay Company's service, at present in command of their brigantine "Cam Owen," to give me the benefit of his experience in regard to ice movements in the Straits. Capt. Hawes has made fourteen voyages to Hudson Bay. He says:

"I can give no rule for the ice other than to work through the thinnest, if there is any difference, but keep in the fair way. Some say keep to the north shore, and so say I, if clear of ice. If the Straits seem full of ice, keep in mid-channel, for I have in general found the ice there thinner than near the north shore and more open to work through."

Capt. Hawes further told me that the route which he had found clearest of ice of late years had been to enter the Straits on the parallel of 61° N. Keep on this till 40 miles west of the Buttons and then haul up to the northward, towards Cape Hope's advance, and Long Island, thence along the south shore to the east point of Charles Island, along the north side of Charles Island and thence a mid-channel course between Digges and Nottingham.

It is stated in the report of ice met with in the "Alert" that no ice was met with on the homeward voyage. The "Cam Owen" sailed from York Factory on the 27th September, 18 5. On the 3rd of October they came up with the ice between Cape Pembroke and Mansfield Island, and from this date to the 21st she was fast in the pack, getting clear of the ice on the 24th and passing out of the Straits, on 27th October pretty well loaded down with ice.

Capt. Hawes places the probable period of navigation for steam vessels properly fitted for ice work as seldom exceeding three months, 15th July to 15th October.

Lieut. Schwatka, of the United States, who spent two years up in the north-west of Hudson's Bay in search of the relics of Sir John Franklin's expedition, in a letter to me dated 29th January, 1885, says:—

"I was in Hudson Bay and Straits and adjoining countries about two years and a quarter, and during that time saw considerable of the navigation of these bodies of

water, and discussed the subject very often with navigators who had spent very many years therein, principally American whaling captains, their officers and crew. From my experience and their conversation, I thought the Straits and Bay could be considered navigable for at least two months of the year for sailing craft and this would probably be more than doubled for steam. Of course the Bay is navigable much earlier and later than the Straits, and the above estimate is for the latter.

"Again, a ship strengthened for the ice might prolong these times on each end considerably, and a complete hydrographic survey of the straits, giving all possible harbors of refuge, would show that there is less danger than there is generally supposed. Signal stations on prominent points could also materially assist vessels essaying the passage by a simple code expressing the conditions of the ice.

"FREDK. SCHWATKA."

In my report last year I described the ice as consisting of three kinds, viz., icebergs, heavy arctic ice and ordinary field ice. The icebergs are stated to have come from Fox Channel. This conclusion was based on the report from No. 3 station made on the homeward voyage of the "Neptune," that the icebergs passed the bluff from west towards east. This report was made on the strength of the few observations which the party had been able to make in the interval between the two calls of the "Neptune" at the inlet. Further and more perfect observations show conclusively that the current sets in the opposite direction and that the icebergs move from east to west. If further proof of the existence of this set were necessary we have it in the drift of the "Alert" when fast in the ice off Ashe Inlet and invariably carried to the westward.

In considering the question of the sources from which the ice affecting Hudson Straits navigation, comes, we must first begin with the east Greenland ice. All those who have made the voyage from any port in Europe to Hudson's Straits seem to agree in the statement that Cape Farewell must not be approached nearer than seventy miles in order to keep clear of the east Greenland ice which sweeps round the cape in an almost ceaseless stream, after rounding which it turns to the northward, and passes up the south-west shore of Greenland, nearly as high as Gothaab, then turns over to the west side of Davis' Straits, and joining the stream of Davis' Straits ice runs south with the arctic current. The limits of the east Greenland ice field, when rounding Cape Farewell, vary greatly, in some years, it moves as far south as the parallel of 58° north. This ice field can be, and is of course always avoided, the rule in making the passage being to keep to the south of 58° north till in longtitude 58° west, on which meridian the northing should be made.

The stream of Davis' Straits ice flows right across the entrance to Hudson Straits, and varies in width with the season of the year. The first information which I have of it was derived from conversation with Captain Watson, of the whaling barque "Maude," of Dundee, owned by Captain Adams. Captain Watson had been for many years engaged in the Davis Strait whale fishing, and for the last few years has commanded his present vessel. Their usual routine is to leave Dundee in March. and they arrive off the edge of Davis' Straits ice in the early part of April, cruising off the edge of the ice between latitudes 58 N. and 63 N. Captain Watson told me, that he made the ice, in April of this year about 58 N. and 120 miles off the Labrador coast, and up to the date of our meeting with him, 13th June, he had not been able to get nearer to Resolution Island than 35 miles, and as the average southerly set of the current is about 20 miles per day, this stream of ice must have been flowing uninterruptedly up to 15th June, the date on which the "Alert" took the pack. An examination of the records of the stations at Port Burwell and Nachvak Bay shows that at Port Burwell the ice cleared out of the Straits on the 9th of April. They remained clear up to the 14th, when the ice came in sight again, and was present almost constantly thereafter until its final disappearance in August. At Nachvak the ice swung on and off the shore with the winds and tide, but though sometimes out of sight from the ordinary observation point, it was always seen upon going to a higher elevation. It is therefore certain that

during the months of May, June and July, large fields of ice were present in the entrance of the Straits, and the question remains, at what date was this ice in such a condition as to permit the passage of vessels strengthened for meeting the ice, but which could be used as freight steamers. For in all questions as to feasibility of the navigation I am not considering the date at which one of the Dundee whaling or Newfoundland sealing steamers could be forced through, but when a strongly built iron steamer, sheathed and otherwise strengthened, could make the passage.

On June the 15th, when we went into the ice, it was certainly impenetrable by any vessel of the class referred to, and though the ice would slacken at the turn of every tide, and sometimes run abroad so that it would have been possible to work the ship to the westward, distances, varying from two to five miles at each of these slack times, I only tried to hold my own, generally under canvas; as apart from any question of the injury which the ship had received, I deemed it more desirable to watch the ice at the entrance of the Straits than to force the ship through, when I could only have made at the most 10 to 20 miles a day. I am of opinion that the Straits were passable at the eastern entrance about the date that we returned to St. John's for repairs, viz., 5th July, but any ship going in at this date would still have been subject to these delays, but might have made from 25 to 40 miles a day.

Proceeding westward, from this date, 5th July, the observations at Ashe Inlet and Stupart's Bay show that on the north side of the Strait, and from 18 to 20 miles out, that the ice was present almost continuously, much as we found it in August; some of the sheets of enormous extent and of great thickness. Many of these were, in August, over half a mile long and some which we measured were from 20 to 30 feet in thickness. In the middle of July, Mr. Ashe reports that open water is visible beyond the ice, and Mr. Stupart, fog-banks and water sky frequently to the north. The two stations at the western end of the Straits also report that in the middle of July the ice was loose and drifting with the tide. Everything goes to show that though there would have been very frequent delays still it would have been possible for a steamship to have got through the Straits by the 15th or 20th July.

Ice would have been met with again, doubtless, in the bay, but I do not think there would have been any serious delay in reaching either Churchill or York Factory.

Stations on shore for the purpose of watching the movements of the ice, though undoubtedly the best system which we can adopt, cannot tell us with any degree of certainty how soon a vessel might be able to push her way through the Straits, but they do tell. when it is sufficiently run abroad, or when a sufficient amount of open water appears, to make the passage a reasonable certainty, and the date for this year I place at from 5th to 15th July, as it is more than likely that a ship could have got through the Straits in ten days. The ice is, moreover, so sensitive to wind that even if telegraph stations were so placed as to be able to convey to ships' news regarding the position of the ice ahead, long before the vessel arrived at the place, the condition of affairs might, and probably would, be totally changed.

As to the closing of navigation in 1884, Mr. Laperrière reports, at Cape Digges, that on 25th October the ice was solid in every direction, and at Nottingham Island a similar entry is made on the 27th. A distinction must be made between the closing of navigation by the formation of young ice, and the presence of a large field of heavy old ice which is cemented together by the formation of young ice between the pans. In the first case any ordinarily powerful steamer could go through without risk, but in the second case the most powerful of the whaling or sealing steamers would be helpless. The western end of the Straits is always subject to incursions of this heavy ice, from Fox Channel, and especially so in the months of September and October, when strong north-easterly and north-westerly gales are frequent, and we have now evidence that in both seasons, 1884 and 1885, this heavy ice came down in October.

As to the length of season for practical navigation, if we regard the presence of field ice as the only barrier, the information which we have got would point to the months of July, August, September and October as being the months in which the Straits are passable. As a rule, in July there will be delays, but to vessels strengthened and sheathed there would be no danger in making the passage.

All the inhabitants of the Labrador, the Straits and the Bay, spoken to on the subject, agreed in stating that the ice movements this year were much later than the average; at Fort Churchill the season was fully a month late, and on the Labrador three weeks, so that I think that it will be found that on the average four months will be the length of the season for practical navigation by steam vessels which would be freight carriers. There have been, I am informed, seasons when the Straits were clear of ice in the month of June, but they are, according to the logs of the Hudson Bay ships, quite exceptional. Capt. Hawes spoke of such being the case only once in his experience of fourteen years, and the dates which I have seen of the arrival of the Hudson Bay vessels at their ports of destination show no arrival earlier than August.

The next important factor in the navigation, is the weather; and the prevalence of fogs, snowstorms, and gales of wind, is shown in the tables appended hereto, for the sake of comparing Hudson's Straits with the Belle Isle route. I have also prepared a table showing the results of the observations at Belle Isle Lighthouse Station for the same period as that for which the observations in Hudson's Straits were taken.

H.M.S. "Terror," Hudson's Straits,

1836—1837.

The following is taken from the records of the cruise of H.M.S. "Terror," in 1836-1837. These records have lately been examined and the observations discussed by Mr. Richard Strachan, and have been published as part of "The Contributions to Arctic Meteorology," a work issued under authority, from the British Meteorological Council, by Mr. R. H. Scott:—

The "Terror" arrived off Hudson's Straits on 30th July 1836, making the edge of the pack about fifty miles to the east of Cape Chudleigh; she worked through, passing close under the south-west shore of Resolution Island, and was, on 7th, August a little to the west of Ashe Inlet, having made good about thirty miles per day, through ice more or less slack the whole time. From this point they worked to the westward up Fox Channel, and passing to the north of Salisbury Island, arrived off Cape Comfort, on 27th October. The ship wintered in the pack, being logged as frozen in, on 1st November, off Smyth Harbor, in lat. 65°, 15' N., and long. 83°, 44' W.

The ship was much damaged by ice pressure, at different times during the winter, and drifted in the ice, from the point at which she was frozen in, to nearly the east point of Charles Island, passing between Nottingham and Salisbury Islands. She was fast in the ice from 1st November to 11th July.

Water is reported as having been seen first on 31st May, in lat. 63°, 14' N, and long. 76°, 39' W., just east of Port De Boucherville, when a lane, ten yards wide, opened in the pack near the ship.

On 19th June, when a few miles to the north of Charles Island, the entry is made for the first time: "a great deal of open water in sight."

The "Terror" is, I believe, the only ship that has ever passed the winter in the pack in Hudson's Straits, and it should be noted that in June and July, 1837, she was in the regular track of vessels, just north of Charles Island.

Although some open water is reported on 19th June, it was not until 11th July that the ship was released, by the breaking up of the floe. From this date, up to 31st July, the ship was working to the eastward along the south shore, in the pack all the time. On the 31st, the day on which the record ends, the ship was in lat. 60°, 59' N., and long. 69°, 18' W., (about half way between Stupart's Bay and Cape Chudleigh) when the report says "ice close."

These records show distinctly that during the entire month of July, 1837, heavy ice was present in large quantities in the Hudson's Straits, that it occasionally ran

abroad, so that the ship could make way through it, and that there were occasional areas of open water met with. I see no reason to doubt that this is the normal condition of the Straits in the month of July ; it coincides with my own experience, with all I can learn from those who have navigated the Straits, and it is the conclusion which I have come to from a study of the temperature charts.

TABLE SHOWING Mean Temperature in Hudson Straits, 1836-37, from the observations made on Her Majesty's Ship "Terror," the means are the arithmetical means of a series of bi-hourly observations

Month.	Temperature.	Remarks.
1836—August...........	+ 31·6	
September......	+ 26·9	Highest temperature, 11th June—59°.
October	+ 16·1	
November	— 4·3	Lowest temperature 2nd December—44·7°.
December.	— 22·7	
1837—January.........	— 18·2	
February.........	— 25·0	
March............	— 10·4	
April..............	+ 14·2	
May	+ 28·8	
June	+ 35·0	
July	+ 37·5	
Year.............	+ 9·96	

METEOROLOGICAL OBSERVATIONS.

The meteorological instruments supplied to the stations were all of the same pattern as those supplied to the regular stations reporting to the Meteorological Office. The thermometer readings have had the corrections applied, and the barometer readings have been corrected for temperature and reduced to sealevel. The anemometers were of Foster's down shaft pattern, except in the case of Stupart's Bay, where an anemograph was used.

In every case, I consider that the wind velocities given are below the actual velocities, as it was almost impossible to secure a good exposure, away from the dwelling houses, that could be regularly visited in all weathers. At Cape Chudleigh I constructed a scaffolding for the anemometer on a hill a short distance to the westward of the house, but before it had been up any length of time, it was blown down and the instrument seriously damaged.

Table I is a general table for the station at Belle Isle Lighthouse, giving temperature from mean of three observations daily, taken at the hours of 2.27 a.m., 8.27 a.m. and 4.27 p.m,, also from maximum and minimum, &c. The direction of the wind is tabulated *in number of times reported* on each of the cardinal and quadrantal points. This portion of the table shows the extraordinary prevalence of westerly winds, and also the number and severity of the gales from October to January.

Table II is a general table for the station at Cape Chudleigh. The observations were taken every four hours at 3.08, 7.08 a.m., 11.08 a.m. and p.m., standard time of 75° W. long., this station is in lat. 60°. 22' N. and long. 64° 46' N. The height of the barometer above mean sea level was 30 feet. The thermometers were exposed in the regulation meteorological service shelter, which consists of an outer shed or case, having Louvre sides and door and a double roof, with an air space open at the sides. The bottom of the outer shed is of large mesh (2 in.) wire net, and the back of close half-inch board. The inner screen is louvred on all sides with thin slats of sheet iron. The whole shelter is attached to the north side of a double close board fence, having a free air space of 4 inches between the two sides of the fence and the

shed is held by iron straps, 3 inches clear of the north side of the fence. The thermometers are hung on light metal straps as nearly as possible in the centre of the inner screen.

The site of the thermometer shed at this station was about 40 feet east of the house and aboutthe same distance from the edge of the cliff; to the S.W. of it was a small hill 26 feet high, and about sixty feet off. The height above sea level was 27 feet, the hill tothe S. W. cut off a good deal of the sun during the winter months. The anemometer was put up on the roof of the house, but the exposure was a poor one especially between N.W. and S.W.

Table III is the general table for station No. 2 at Skynner's Cove, Nachvak Bay, situated in lat. 59° 6' N. long., 63° 37' W. Nachvak Bay is a deep fjord running westwards into the interior. Shortly after entering, the fjord widens, forming two coves, one on the north and the other on the south side. The one on north side was the site selected for the house, the little cove runs nearly half a mile back from the general trend of the coast on the north side of the fjord, and gives fair shelter and anchorage. On the north side of the cove the land rose abruptly from the beach to a little platform about twenty feet above the mean sea level. On this platform the house was erected and the thermometers exposed in the same manner as described at the last station.

On either side of the cove the mountains rose almost precipitously to a height of nearly 3,000 feet. The sun was cut off a good deal by the hills on both the sides of the cove, and also during the winter months by those on the south side of the fjord.

The wind observations recorded here are entirely from estimate of velocity; and directions was taken as a rule from the motion of the lower clouds. The anemometer was at first erected on the south-west point of the cove, but in one of the early fall gales the tower was destroyed, and the instrument so damaged that it was rendered useless.

Table IV results at Ashe Inlet. This station is situated on the north side of the Straits in a small inlet, on the large island which forms the south side of North Bay. It is called by Lieut. Schwatka, Turenne Island. The station was in lat. 62° 33' N., Long. 70° 35' W. All the instruments had a good exposure, except the anemometer which was partially sheltered from east and north-east winds.

Table V results at Stupart's Bay. This bay is situated near the north-west angle of Prince of Wales Sound. The sound is itself a deep bay about 30 miles across by 20 miles in depth, with numerous outlying shoals in the line of the coast, but deep water inside. The station at the head of Stupart's Bay was somewhat sheltered from north winds, otherwise the exposure was good. The position of the observatory was lat. 61° 35' N. long. 77° 32' W.

Table VI results at Port De Boucherville, there was not a barometer at this station and the anemometer was somewhat poorly exposed, being sheltered from N. E. to N. W. by the rocks which rose almost perpendicularly behind the house.

The station was situated in a little bay near the S. E. point of Nottingham Island. The house is in lat. 63° 12' N., and long. 77° 28' W.

Table VII results at Port Laperrière. This station is situated at the outer Digges Island and is in lat. 62° 34' N. long. 78° 1' W. The anemometer was sheltered from east and S. E., but the exposure was on the whole good. In all cases, except Port Burwell, the anemometers were five feet clear of the ridge of the roof of the house.

Table VIII results at Churchill. The station here was at the residence of the Chief Factor, Mr. Spencer, who undertook the work of taking observations. The station is in lat. approx, and long It is about five miles south from the ship's anchorage, and the same distance from old Fort Prince of Wales. The thermometers were exposed on the north wall of the house and read through a small window. There was no fire or heating apparatus in the room and the doors of the shed were opened by cords without opening the window. This exposure admittedly an undesirable one, was the best obtainable under the circumstances,

and as the thermometers were read without opening the window and were constantly screened from direct radiation by the doors of the inner screen, I do not think that the mean temperatures are likely to be affected to any appreciable extent.

Table IX gives the mean temperature, and other results, at York Factory, for the period 1876 to 1883 inclusive. The results for this year have not yet been received.

Table X shows a comparison in duration of snow in Hudson's Straits and the Straits of Belle Isle. This is an element which will be found to vary greatly from year to year, but its bearing on navigation is direct, for in the fall snowstorms, navigation in Hudson Straits will always be dangerous; as it is almost impossible to keep a look out. The snow, when the temperature begins to fall, is not in the ordinary flakes, but drives before the wind in minute particles of ice, which the eye does not perceive in time to protect itself.

The observations of snowfall in the Straits during the months of July, August and September, of 1885, show that none fell in July; and only a passing storm, lasting four hours, visited one station on the north shore in August. In September there was some snow, most of which fell in the last few days of the month, so that, generally speaking, we may state that snow would not have been any obstruction to navigation in these months. In October, of 1884, a great deal fell, amounting in duration, on the average of the five stations in the Straits, to 109 hours. Whether October, 1884, was exceptional in this particular or not, it is impossible to say. Capt. Falconer, in his diary, 1768-69, states "that gales of wind averaged, in September, about two per week, but were not so numerous in October."

In September, 1884, when homeward bound in the "Neptune," we had, generally speaking, fair weather all through, and the returns from the stations show that there were more gales in October, 1884, than in September. It seems, however, to be the general impression amongst those who have traded and fished to the Northern Labrador, as well as amongst the whalers, that October is, in those latitudes, a finer month than September, so that October, of 1884, may prove to have been quite exceptional.

Table XI shows a comparison between Hudson's Straits and the Straits of Belle Isle in regard to the duration of fogs.

In the matter of fogs, the Hudson's Straits route undoubtedly compares favorably with the Straits of Belle Isle.

If we compare the mean of the six Straits stations, excluding Churchill, with the station at Belle Isle Lighthouse, we find that in September and October, 1884, and June, July and August, 1886, the relative duration of fogs in Hudson Straits, as compared with the Belle Isle Station, was in

1884,	September,	40	per cent.
do	October,	10	do
1885,	June,	26	do
do	July,	46	do
do	August,	74	do

Table XII is a comparison table between Hudson's Straits and the Straits of Belle Isle, of the number of days on which the velocity of the wind exceeded forty miles an hour.

Tables XIII to XVII show number of winds reported from each of the sixteen points at the stations, and the average velocity for each direction.

Table XVIII shows mean temperature at Frederckshaab, 1856-60.

Accompanying the report are maps showing the mean isotherms for the months September, 1884, to August, 1885. In drawing these isotherms, I have used the actual observations, and have, wherever possible, supplemented this by reducing observations taken at other periods, to that in question.

The January map shows: temperatures over the Bay and Straits of —15°, —20° and —25°, the higher temperatures being at the eastern end of the Straits.

In February, the temperature, owing to prevailing easterly winds has risen 20° on the mean, and shows above zero at Cape Chudleigh.

March, again dips down, the mean temperature ranging between —20°, off Mansfield and Southampton Islands, and —5° at the eastern end of the Straits.

In April, the mean temperature is now everywhere above zero, the 5° isotherm passing Mansfield Island about the same place as —20° did in March. Temperature in eastern end of the Straits is 15°, showing a somewhat more gradual rise than in the west.

In May, temperature in the Straits lies between 25° and 30°, whilst over the northern part of the Bay the temperature is still low.

In June, the isotherm of 35° passes just south of the Strait, where the temperature is now probably about the freezing point (32°). The freezing point of salt water being about 28°·5° I regard this month as the first in which there is likely to be any tendency on the part of the ice to break up or waste. The maps shows temperature in Straits of Belle Isle to range now between 40° and 45°.

July, in this, the warmest month of the year, the curve for 40° passes right through the Straits. Ice wastes rapidly, as shown by the reports of Mr. Ashe, who says the harbor ice decreased in thickness from 3 feet 3½ inches, on 2nd July, to 1 foot 9½ inches, on the 8th. All stations report movements of the ice fields, showing distinctly that whether visible or not from the stations there was a considerable extent of open water in the Straits.

August, the temperature is almost precisely the same as in July.

September, in this month, the mean temperature of the Straits is about 32°; but though the ice would form on the fresh water lakes, none would be made on the salt water, and as far as ice is concerned, this is the cleanest month for navigation in the whole year.

In October, the mean temperature of the western end of the Straits has fallen to 17°. Young ice makes rapidly, especially towards the end of this month, when I would consider it a great risk to put a ship into a pack of old ice, and the western end of the Straits will always be liable to incursions of old ice from Fox Channel.

In November, the mean temperature of the Strait, west of Stupart's Bay, has fallen to 5°, which, I consider, practically closes the navigation. It will perhaps be better understood what an average temperature of 5° means, in regard to matters pertaining to navigation, when I point out that this is the mean temperature of the month of January along the north shore of the Gulf of St. Lawrence, from the Saguenay to the Straits of Belle Isle.

In December, the mean temperature ranged from —15° in the western end of the Straits, to —5° at Cape Chudleigh.

NOTES BY OBSERVERS.

Belle Isle, 1884-85.

November, 1884.

15th. SS. "Iceland," last vessel seen in Strait. (Ice closing Strait not given.)

March, 1885.

28th. First snow buntings seen.

May, 1885.

9th. Straits covered with field ice; no clear water in any direction.
16th. Straits begin to clear.
23rd. Ice formed on pools 2 inches thick.

June, 1885.

13th. Good deal of ice still in Straits.
17th. First thunder.
19th. First steamer passed in.
20th. 100 vessels passed north.

PORT BURWELL, STATION NO. 1.

August, 1884.

10th. A heavy sea in the Straits.

12th. Grass grows very scantily, only a few spears showing up through the moss. The moss grows wherever there is any soil; it grows to a height of about 7 inches. A few cranberry vines here and there.

15th. Hills to the east covered with snow. A number of whales and sharks in the harbor.

17th. Heavy sea in the Straits.

29th. Harbor covered with ice this morning.

30th. Numbers of sea-birds about to-day.

September, 1884.

1st. Numerous whales feed in the Harbor.

5th. Numbers of gulls and sea-ducks in the Harbor.

9th. First snow at station.

15th. Ship seen in the Straits bound east.

18th. Numbers of mers have been here till now, but they seem all to have gone south.

24th. Large numbers of ptarmigan.

27th. "Neptune" arrived, homeward bound.

29th. "Neptune" left for Nachvak.

October, 1884.

22nd. Almost impossible to measure snow; some places it is 5 or 6 feet deep, and in others perfectly bare.

23rd. A number of white foxes seen.

November, 1884.

2nd. Some of the snow drifts are 20 feet deep.

6th. No seagulls or ducks here now; the ducks assembled in large flocks before leaving.

9th. Much of our snow is blown into the sea; so we have less here on the ground than in the interior.

24th, 25th. Tremendous gale; cups blown off anemometer; at 5:15 p.m., 24th it was registering 84 miles per hour.

November, 1884.

26th. A number of ravens here. Lunar halo at 6:30 p.m

December, 1884.

6th. Solar halo.

9th. Brilliant meteor at 7:08 p.m.

10th, 11th. Solar halos.

26th. Lunar halo from 5 to 7:30 p.m.
28th. Lunar halo at 5:30 p.m.
29th. Solar halo at 11:45 a.m.

January, 1885.

3rd. Lunar halo 10:30 to 11:30 p.m.
10th. Solar halo and parhelia 1:30 p.m.
25th. Parhelia at 9 a.m.
27th. Large masses of vapor rise from the cracks in the ice field.

February, 1885.

5th. Solar halo 3:30 p.m. Brilliant meteor at 10 p.m.
6th. Solar halo 3 p.m.
18th. Double solar halo and parhelia.
20th. Solar halo and parhelia.
24th. The ptarmigan begin to come back.

March, 1885.

The tops of the hills have remained clear of snow all winter, but the ravines are full of snow.

April, 1885.

5th. Solar halo 10:30 a.m. to 4 p.m.
6th. Thawing in the sun to-day for the first time.
8th. Thawing in the sun.
15th. Some small grey birds have come.
17th. Eskimo tell us that the deer are coming north. They have seen herds of twenty or thirty at a time.
29th. Ptarmigan are very numerous now.

May, 1885.

6th. The snow has been melting very rapidly the last two or three days, many of the slopes are bare.
10th. The snow goes very rapidly, the water running in streams down the hillsides.
20th. Some hawks have been seen lately, and several kinds of small birds.
22nd. A few wild geese have been seen here.
24th. Several caterpillars seen to-day crawling over the snow.
25th. Solar halo.
30th. Solar halo and parhelia. Insects are now putting in an appearance, spiders and flies coming together.
31st. Snow disappearing rapidly, large streams of water now run in the valleys.

June, 1885.

1st. The grass on the hill sides begins to sprout and the moss is tinged with green.
3rd. Small purple flowers show up here and there through the moss, the grass does not make much headway.
4th. Ptarmigan are pairing.
9th. Loons flying north.
27th. Seals very numerous now. Rainbow 8 to 8:15.

July, 1885.

1st. Bright yellow flowers are now in bloom.
5th. Mosquitos very numerous.
6th. Butterflies seen.
7th. A number of different flowers are in full bloom.
20th. The grass seems to have attained its full growth, but is very short.
22nd. Solar halos.
26th. Sea gulls and ducks have their young.
27th. Various kinds of ducks are now numerous, there are also large flocks of birds which look like plover. No codfish in the harbor yet.

August, 1885.

13th. Two large whales in the harbor to-day.
16th. Meteor at 8:55 p.m.
17th. Codfish are now numerous in the harbor.
21st. Parhelia from 5:45 to 6 p.m.
23rd. A small sailing vessel seen in the Straits to-day.
26th. Codfish are in great abundance.

September, 1885.

10th. The mountains are now covered with snow.
29th. Station relieved.

Skynner's Cove, Station No. 2.

October, 1884.

8th. Lunar halo.
11th. Visited by Eskimo. Some seals shot to-day.
16th. A whale in the Bay to-day.
29th. Black ducks numerous in the Cove.

November, 1884.

9th. Shot a seal to-day.

December, 1884.

3rd. Visited by Eskimo to-day.
4th. White foxes come to the door of the station.
9th. Lunar corona.

January, 1885.

5th. Took the temperature to-day in an Eskimo snow house at the level of the beds; found it to be 28°. Temperature of the air outside—23·4°.
12th. Eskimo houses nearly blown away by the gale, though they were plugging them all night.

February, 1885.

23rd. Shot two ptarmigan.
27th. Five starving natives arrived.

March, 1885.

3rd. Four starving Eskimo at station for the night.
10th. More sick and starving Eskimo.
20th. Saw a raven to-day for the first time this year.

April, 1885.

4th. Snow thawed a little to-day, in the sun; deer tracks freshly made seen within two miles of the station.
6th. A fly seen to-day.
10th. First rain, snow thaws rapidly, ground in low places muddy.
18th. First small bird seen.
22nd. Lunar corona and halo; shot a seal.
28th. Solar halo. A deer passed across our valley to-day.
30th. Fourteen deer seen to-day.

May, 1885.

3rd. Saw four deer to-day.
5th. Snow thaws very rapidly.
7th. Snow slides down the mountains with loud noise.
9th. Got fresh trout from Lane the interpreter.
10th. Six deer shot in the Bay.
16th. The Hudson Bay Officer returned from Mission post to-day; he tells me that they have onions, lettuce and radishes well grown already in a hot-bed surrounded by snow and covered at night.
18th. Eskimo have all gone south to the open water.
20th. A great many flies outside to-day.
23rd. Partial solar halo.
27th. Blowing a hurricane to-day.

30th. Established "Bench Mark" to-day at twelve feet above mean ice level $\frac{\textbf{W.S,}}{\textbf{1885.}}$ The mark is on a rock at the south-west point of the cove.

31st. Partial halo visible after sunset.

June, 1885.

3rd. Rocks are continually running down the larger ones, getting out on the ice.
17th. Grass now growing; willows budded on 1st June at the Hudson Bay post twenty miles west.
23rd. Trout are now caught with nets at the head of the Bay.
24th. Lettuce, cabbage and turnips are up in the garden at the post.
26th. Various flowers in bloom.
28th. Blew a hurricane last night; small stones and gravel blown against the house.

July, 1885.

4th. Saw fifty seals on the ice to-day, also a large number of bumblebees.
5th. Mosquitoes appeared to-day.
6th. A hot wind to day at 6 p.m.
12th. Black duck and a loon in the cove to-day.
15th. The sides of the mountains are now green in many places with short coarse grass and willows; there is but little snow except high up on the ravines.
18th. A whale in the bay to-day.
20th. Cod-fish are expected by the natives to arrive to-day.

24th. Trout fishing good; no cod yet.
29th. Tigging for cod, no fish.
30th. Hudson Bay trader says the ice is very late this year, is usually all gone 20th July.

August, 1885.

1st. "Alert" arrived at 8.30 p.m. January, and also the Newfoundland schooner "Lassie."
4th. 1 dozen cod caught in the traps, fish not in yet.
7th. Fish in to-day.
8th. The schooner "Vita," of Little Bay, Newfoundland arrived.
16th. Steamship "Labrador" passed on her way to the Post.
18th. Steamship "Labrador" passed bound out for Chimo.
26th. Very heavy surf breaking.
29th. Cod very plentiful.

September, 1885.

3rd. The schooner "Lassie" caught fifty quintals of cod in the traps to-day.
12th. The schooner sailed for Fogo, Nfld., to-day; take, about five hundred quintals. They have taken longer to get their cargo than for years past.
17th. Steamship "Labrador" passed to the Post.
22nd. Cod very plentiful.
26th. Blew a hurricane from 5 to 10 p.m.

October, 1885.

8th. Station relieved.

ASHE INLET, STATION NO. 3.

September, 1884.

5th. Velocity of wind 51 miles.
11th. Hair hygrometer though set in the usual way seems to give from 10 to 15 per cent. less humidity than the wet and dry bulbthers.
21st. Anemometer frozen up.
22nd. "Neptune" arrived homeward bound, staid only 3 hours.

October, 1884.

2nd. 9:30 p.m., wind began with a sudden squall, velocity 36 miles per hour, having been previously a dead calm.
18th. Snowgauge put in position for trial. Wind began to blow suddenly from N.W. 34 miles per hour at 2 p.m.
21st. Sudden squall 45 miles per hour N.W. at 8:45 p.m.

November, 1884.

24th. Heavy gale from S.E. all day, 10:30 p.m. 74 miles per hour. Min. ther. broken.

December, 1884.

2nd. Moon at rising surrounded by bright red coloring extending for about 10° from moon; when two hours high still surrounded but color faint.
9th. 11 a.m., parhelia.

January, 1885.

8th. Lunar halo 3 a.m.
23rd. Lunar halo and parselenar.
29th. Ice crystals fell from a hazy sky all day. Eskimo visited the station.

February, 1885.

21st. Lunar halos, ice crystals, hoar frost.
22nd. Lunar halos, hoar frost.
23rd. Hoar frost.
24th. Hoar frost.
28th. Lunar halo.

March, 1885.

16th Partial solar eclipse, estimate of extent] of eclipse 0.75. Lower portion of the sun uneclipsed.
22nd. Doors blown off thermometer screen.

April, 1885.

11th. Our first real thaw.
17th. First snow bird seen.
29th. First ducks, a flock of thirty seen.

May, 1885.

2nd. First rain fell.
6th. Frst flies seen, species un known, very like ordinary house fly.
7th. Sea gulls returned to-day.
8th. First caterpillar found.
27th. Placed beacon on highest point of Rabbit Island.
31st. First bumblebee seen of a deep orange color in the lower body. Lit signal lamp and kept burning 11 p.m. to 3 a.m.

June, 1885.

2nd. First spider (small black one) seen amongst the moss.
4th. First grey linnet seen and hawk shot.
5th. Eskimo arrived, they have shot a goose. First loon heard to-day.
6th. First sand pipers seen.
18th. Two loons flew past the house to-day, they are the first seen.
22nd. Two butterflies seen, a small white and a medium brown.
24th. Eskimo arrived in two whale boats.

July, 1885.

2nd. First mosquitoes.
6th. A heavy clap of thunder in the west, heard at 9 p.m. The Eskimos seemed terrified and spoke of rain with thunder as being very rare here.
26th. Mosquitoes now very plentiful.

August, 1885.

9th. Eskimo report a brig hove to, outside the ice pack east of the island.
12th. Steamer trying to make the inlet.
13th. Steamer in sight drifting with ice.

14th. Steamer passed out of sight to the westward.

17th. Saw the "Alert" in the ice making for the inlet. American barque, "George and Mary," passed west in the pack.

September, 1885.

19th. "Alert" arrived at 8 a.m., and station was relieved.

STATION No. 4.—STUPART'S BAY.

September, 1884.

1st, 2nd. Fog and rain.
4th. Freezing rain.
6th. Light snow,

October, 1884.

6th. Lunar halo 11 p.m.
7th. Easterly snowstorm.
23rd. Most brilliant aurora.

November, 1884.

12th, Brilliant aurora.

December, 1884.

9th. Auroral arch extending across the sky from west to east, also perfect corona.
19th. A few ducks still remain near the mouth of the bay.
31st. Slight fog nearly all day.

January, 1885.

1st, 2nd, 3rd. Lunar halos.
20th. Very heavy gale.
24th. Ice crystals.
29th. Lunar halo 3 a.m.

February, 1885.

3rd. Fog and drifting snow.

5th. Heavy easterly gale. All instruments having exposed metallic surfaces are covered with ice.

10th· Easterly breeze has raised the temperature wonderfully. At 3 a.m., wind west, 14', hazy, temperature—20°1; at 11 p.m. wind S.E., 26'10' stratuss temperature + 22·4.

11th. Warm all day, maximum 27·9, minimum 21·9.

21st. Brilliant solar halo and parhelia. Two halos rich prismatic colors at times. The arc above the outer circle is occasionally most brilliant. These were vertical and horizontal, with radiants from the sun to the inner halo. At night bright lunar halo and parselenae.

25th. N.W. wind brings the fog in off the Straits, and the moisture falls in a frozen state to the ground. I have called this "frozen fog."

March, 1885.

5th. A clear bright day. Aurora, class I, at 11 p.m.
7th. Parhelia at 3 p.m.

21st. Heavy N.W. gale, 11 p.m. Squalls of hurricane force, from 80 and 90 miles per hour; drift undescribable, the night beggars description.

25th. School of porpoises passed along shore going west. Lunar halo at 11 p.m.

30th. Eskimo report porpoises off the point.

April, 1885.

2nd. Solar halo.

11th. First small bird appeared this afternoon.

17th. A few ducks flew over to-day.

May, 1885.

4th. A few drops of rain fell to-day.

8th. Extraordinary visibility; from Look Out Point, could see an immense distance.

12th. Thickness of ice in Bay, 5 feet 5 inches. This is the first day on which ducks have appeared in numbers; at 5 p.m. hundreds were flying about and swimming in water near the island. Ptarmigan came near the station to-day.

30th. Flock of wild geese seen flying north—first this year.

June, 1885.

3rd. Eskimo report that from a hill, some distance west, open water can be seen to the north.

July, 1885.

25th. Hoar frost at night.

August, 1885.

9th. No ice to be seen in any direction.

STATION NO. 5, PORT DE BOUCHERVILLE.

September, 1884.

1st. Geese flying south in large numbers.

17th. Auroral twilight, sky brightest to N.E.

20th. S.S. "Neptune" arrived homeward bound.

October, 1884.

9th. Auroral display.

14th. Brilliant auroral arch from N.E. to N.W.

15th. S.E. gale this p.m.

December, 1884.

14th. Very brilliant auroral arches.

21st do do.

January, 1885.

1st. Faint lunar halo. Several brilliant auroras during the month.

February, 1885.

7th. Parhelia at 3 p.m.
18th. Solar halo and parhelia.

March, 1885.

1st. Lunar halo 11 p.m.

April, 1885.

5th. Parhelia at 3 p.m.

May, 1885.

9th. Shower of hail lasting five minutes between 7 and 11 a.m.
30th. Snow is at last melting rapidly.

June, 1885.

18th. First rain fell.

August, 1885.

13th. Straits completely clear of ice.
24th. "Alert" arrived and station was relieved.

STATION NO. 6, PORT LAPERRIERE.

October, 1884.

20th. Saw three ships to-day working eastward in the Straits.

April, 1885.

28th. Three sea gulls seen to-day for the first time.
30th. First small land bird seen to-day, the ravens have been here the whole winter.

May, 1885.

1st. An immense number of ducks seen to-day.

June, 1885.

1st. The column for "Total Snow on Ground" has not been filled up, but I think that 4 feet would be a good average for the total fall of snow during the winter. We have never had a heavy snow fall, but always light snow and falling during short period. It always drifts, leaving the ground bare in some places, with large masses in others. This has made it impossible to measure the snow fall and fill up the column headed as above.
3rd. First rainfall of the year.

August, 1885.

25th. "Alert" arrived; station relieved.

YORK FACTORY.

1875—1882.

First rain, 24th March, 13th May. Last rain, 21st September, 29th October.
First snow, 8th September, 28th September. Last snow, 26th May, 18th June.

Snow birds, 17th March, 9th April.
Summer eagle, 19th March, 20th April.

Geese	appeared	21st April, 3rd May.
Plover	"	28th April, 14th May.
Mosquitoes	"	8th June, 21st June.
Swallow	"	11th May, 26th June.
Frogs	"	26th April, 17th May.
Robins	"	27th April, 13th May.
Ducks	"	23rd April, 10th May.
Snipes	"	25th April, 17th May.
Fire-flies	"	July and August.

The two dates are the earliest and latest records in the group of years.

Fort Churchill.

September, 1884.

21st. Snow showers during day.
30th. Snow showers throughout day.

October, 1884.

8th. First appearance of ice forming on shores of river.
10th. Began wood hauling with dogs and sled. Ice still forming.
13th. Thin ice drifting on river.
15th. No ice on river.
19th. Large quantities of ice are drifting about in the river.
21st. Ice still floating.

November, 1884.

6th. Churchill River frozen over as far down as the Old Fort.
11th. Churchill River opened again to-day.
21st. River entirely frozen over.

December, 1884.

24th. Eight inches of snow on ground.

January, 1885.

5th. Sixteen inches of snow on ground.
16th. Total depth of ice in channel of river, 3 feet 10 inches.
26th. Mercury frozen.
30th. Mercury frozen.

February 1885.

7th. Mercury frozen.
18th. 8 inches of snow on ground.

April, 1885.

1st. Snowbird seen to-day.
2nd. Rain during night, first of season.

May, 1885.

28th. First thunderstorm in west at 6 p.m.

June, 1885.

10th. Channel of river open opposite the Fort.
27th. River open for a little, but below the fort.
30th. River opened out to-day.

July.

11th. Ice came up the channel with evening tide.
30th. Light frost this morning.

August.

10th. Light frost this morning.

SEA TEMPERATURES.

Table XIX gives the daily mean temperature of the sea surface. The positions given are the noon positions each day.

From May 27th to July 31st, the result entered is the mean of a Bihouly series of observations extending from midnight to midnight. From August 1st to October 18th, observations were only made every four hours.

LABRADOR COAST 55°N. 56°W.

An examination of the table, by charting the temperatures shows, for the Labrador coast, say in lat. 65° N., long. 56° W., that the surface temperature, which, when clear of the ice pack in the early part of June, was 37° nearly. It had by the second week of July, got heated up to 41°; and by July 30th, notwithstanding the presence of numerous icebergs, the temperature had risen to 50°, falling again by Oct. 10th, to 34°.

HUDSON'S STRAITS.

In Hudson's Straits, for the first 20 days of August, the ship was always in the ice; the average surface water temperature for this period is 31° 3. On the 21st, the ship got clear, and when clear of the pack, we found the temperature on the south shore, and west to Nottingham and Digges, up to 36° and 35°. In September the temperature of the western end of the Straits, 33°, and at the latter end of the month, in the eastern half, no mean of a day, while at sea, was as high as 32°.

The sea temperature conditions observed in Hudson's Straits this year, are exactly the reverse of those found, in 1884, on the voyage made in the "Neptune." In 1884 the ice met with was heaviest on the south shore and in the west end of the Straits. In 1885 all the ice was on the north shore and the east end of the Straits. Similarly, in regard to temperature on p. 12 of the report of the H. B. Expedition, 1884, the fact is recorded, that the highest temperatures were found in the eastern end of the Straits, in 1885, both going out and coming home, the surface temperatures were higher at the west end of the Straits.

HUDSON'S BAY.

In Hudson's Bay the last few days of August, and the 7th to 10th of September, the temperature was 38° 7 to 38° 4, the observations both going and returning, showing slightly higher temperatures on the eastern than on the western shores.

On Hudson's Bay soundings were taken every four hours, both going out and returning; and a Nigretti & Zambra automatic registering thermometer was used to get the temperature at the bottom. The highest bottom temperature recorded was 41°, and the lowest 37° 5.

SURVEYING WORK.

Owing to the exceptional delays experienced this year, I was able to do very little in the way of adding to our knowledge of the hydrography of the Bay and Straits.

The following work was, however, accomplished:—

(1.) Track survey from steam launch, of Outer Digges Island, by Dr. Bell and Mr. Tyrell, P.L.S. I also got good observations for position at the observing station in Port Lapierrière, the longitude results agreeing within 4 seconds of that determined last year. I obtained observations here both going out and returning, at an interval of eighteen days, the assumed rates for the chronometers agreeing most satisfactorily with that found by observation.

(2.) Running survey of the west side of the northern group of Ottawa Islands.

(3.) Tidal observations in Churchill Harbor.

(4.) I also took a series of soundings across Hudson's Bay. Maximum depth found was 94 fathoms.

Copies of the plans and results will be forwarded hereafter.

THE RESOURCES OF THE BAY AND STRAIT.

Apart altogether from the question of the navigability of the Straits as a practicable commercial route for the transport of produce from the North-West Territories of Canada, the resources of the Bay and Straits are well worthy of attention, and will, in my opinion, amply repay those who undertake their development.

In my report of last year I drew attention to the fact, that the whole of the fishing and trading done in the Hudson's Bay region is at present in the hands of the Hudson's Bay Company and the New England whalers.

The whale fishing, walrus hunting and porpoise fishing are capable of great extension, and are certainly profitable pursuits, since our neighbors to the south of the boundary line can afford to keep ships in commission for eighteen months in order to fish for less than four. The waters of Hudson's Bay are wholly within the Dominion, and the right of Canada to protect these waters and keep them for her own citizens is, I think, unchallenged. In the case of the White Sea in Northern Russia, the Russian Government charge high licenses for the privilege of fishing, and prescribe the methods to be used in capturing the fish. I would strongly urge the advisability of protecting these fisheries; and in any negotiations with the United States Government in reference to right of United States citizens to fish within the territorial waters of Canada, the value of the Hudson's Bay and Straits region as a fishing ground should be strongly insisted on; and under any circumstances, our Government should retain the right to prescribe the methods which may be used.

The salmon and trout fisheries continue to be prosecuted by the Hudson's Bay Company; their refrigerator vessel, the "Diana," taking home this year upwards of thirty tons of fresh salmon and several tons of trout. The Company have evidently in view the development of this branch of their trade, inasmuch as they have this year brought out a small vessel, of some twenty tons, to carry on the coasting trade between their stations in Ungava Bay.

The mineral resources of the Bay, as well as the natural history, have been treated of by Dr. Bell, who has both years accompanied the expedition as medical officer and geologist, and who had also, on previous years, visited both the east and west coasts of the Bay. Dr. Bell's report shows the extent of these resources, and if railway communication were established with any part of the Bay, it would be possible to prosecute the whale fishery, porpoise fishing, salmon fishing and walrus hunting much more advantageously than can at present be done. Suitable vessels, such as strongly built schooners, could winter in the Bay, and the crews be sent up in the spring of each year.

Every U. S. whaler which goes into Hudson's Bay is also an unlicensed trader, competing with the Hudson's Bay Company for the trade with the Esquimaux, the

Company paying full duty on all articles imported for trade, whilst their competitors from New England take, duty free, goods from bonded stores or goods manufactured in the U. S., as best suits their business.

The following is Dr. Bell's report on the Geology of the Hudson's Bay Region :—

THE GEOLOGY OF HUDSON'S BAY AND STRAIT.

By Robert Bell, B.A. Sc., M.D., LL.D.

Assistant Director of the Geological Survey, Medical Officer to the Hudson's Bay Expeditions.

In the following chapter I propose to give the geological results, not only of the expeditions of 1884 and 1885, but also of the various journeys which I have made to these regions in previous years. The description will include references to all the useful minerals which have been discovered around the shores of the Bay and Strait, with their geological relations, and it will be followed by a brief account of the economic minerals of the Hudson's Bay territories generally, which it is believed will prove useful in the present report. James' Bay, the southern prolongation of Hudson's Bay, will be included in the description of the latter.

The opposite sides of Hudson's Bay differ from each other, both in physical characters and geological structure. As a rule, the eastern side, or Eastmain coast, as it is called, is rocky, and much of it is bold and high, while the western shores are mostly free from solid rocks and low, with shallow water extending out considerable distances. In the north, a group of large islands, lying between the Bay and Fox Channel and Hudson's Strait, consists partly of Silurian limestones, and partly of older rocks, apparently Laurentian.

EAST SHORE OF HUDSON'S BAY.

The following description of the geology of the Eastmain coast will begin in Rupert's Bay, at the southern extremity, and proceed northward. I made a geological reconnaissance of this bay in 1875, and in 1877 the exploration was extended to Cape Dufferin, the western extremity of the Portland Promontory, a distance of 600 miles in a straight line from Moose Factory, at the head of James' Bay. A rough survey was made in the interval between Cape Jones and Cape Dufferin, about 300 miles in length, and a map showing this part of the coast, with the adjacent islands, was published with my report for 1877.

The first high ground met with on the eastern side of James' Bay is Sherrick's Mount, a large elevated peninsula or island. At low tide it is connected with the mainland, but when the tide is high it is separated from it by marshes and a strait of shallow water in its rear. On the north-west shore of Rupert's Bay, between the river of the same name and this island, Laurentian gneiss is exposed at several points. The color is generally gray and the texture rather coarse. It is composed of quartz and felspar with only small quantities of hornblende and mica. The general run of the bedding varies from N. 45° W. to N. 60° W. (magnetic). A small island, about 80 feet high, in the middle of Rupert's Bay, called the Stag Rock, consists of reddish grey, rather coarse gneiss, running east and west. (Geological Survey Report, 1875, page 323.)

Viewed from a distance, the outline of the land on the east side of James' Bay is undulating and rather low. The coast is fringed by a great number of islands, with long points and peninsulas of the mainland among them. The water between

these islands and points, and for some distance out to sea, is shallow. The majority of the islands are rather low and composed of boulders and shingle, with few or no trees, but the solid rock occurs upon a large proportion of them. The shingle is arranged in conspicuous terraces, marking the recession of the waters of the Bay, a subject which will be again referred to. No regularity can be detected in the general arrangement of these islands, points and peninsulas. They present a kind of labyrinth which it would be very difficult to map with accuracy, and which is not unlike that of the north-eastern shore of the Georgian Bay, Lake Huron, except that on the east coast of James' Bay the water is shallow and shows the above-mentioned evidence of receding rapidly, whereas the islands of the Georgian Bay labyrinth are mostly rock, with deep water in front. (Geological Survey Report, 1877, p. 11c.)

In going from Rupert's Bay to Cape Jones, where we enter Hudson's Bay proper, the rocks, as far as observed, consist of Laurentian gneiss, with a belt of Huronian schists at Cape Hope and another at the Paint Hills. The gneiss presents a great variety of characters in this distance, which it would be tedious to give in detail, especially as these rocks appear to be almost destitute of economic minerals, as far as we know at present. At Rupert's Bay the average strike is west north-westward, but in going towards Cape Jones it gradually changes to north-west and north north-west.

All along the east side of James' Bay, dykes of dark-colored compact trap were observed in numerous places cutting the gneiss. They were of all dimensions, up to 80 feet or more in width. In every case where their course was taken it was found to be due north and south (magnetic), or nearly parallel to the shore. This course also corresponds with the general direction of the great dykes which are so prominent along the Mattagami River. (Geological Survey, Report, 1875, p. 315.) Such dykes have, no doubt, had something to do with shaping the topographical features of this region. It is worthy of remark in this connection that the whole east coast of Hudson's Bay runs, in a general way, nearly due north, and that if we trace its meridian on northward we will find that it follows a water-way or a series of north and south breaks in the land all the way to the north pole, or as near to it as our knowledge extends.

HURONIAN ROCKS OF THE EAST COAST.

Belts of rocks which may be classified with this series occur at Cape Hope, the Paint Hills and apparently on the southern side of Richmond Gulf. The western extremity of Cape Hope consists of dark grey hornblendic schists with some lighter and more silicious belts. These rocks are mostly divided into small lenticular forms, with granular white calcspar in the interstices. They are cut by numerous irregular straggling veins of mixed calcspar and quartz, intercalated with schists. No metallic ores were noticed in any of them.

The Paint Hills are situated on a point with several islands lying off it at a distance of about 39 miles north of Cape Hope. The name appears to have originated from the circumstance, that here the smooth rounded rocks are stained to reddish and brownish colors by iron oxide. The rocks consist of micaceous and hornblendic silicious schists with epidote in crystals and patches, and epidosite in masses of varying size. The schists are full of disseminated specks of white iron pyrites, which have given rise to the stains just referred to, and they also contain a good deal of white calcspar in the form of partings in the joints and cleavage-planes and as isolated patches. On an islet, half a mile north of the point, the rock is a dark grey mica schist, full of rounded pebbles of light grey, fine-grained granite and of several varieties of silicious schists. The pebbles are mostly small, but some of them measure about eight inches in diameter. The cleavage runs east and west, but the bedding, which is very distinct, strikes N. 10° W. A vein of pegmatite, in which the quartz is reddish-white and the felspar takes the form of a very large white crystals, traverses the islet parallel to the strike. A greenish schist occurs on another islet about six miles northward of the Paint Hills. The breadth of the

Huronian band of this locality may be two or three miles. On the outermost islands, several miles to the south-eastward of the extremity of the point at the Paint Hills, the rocks consist of fine-grained dark greenish-grey hornblende schist, with compact silicious portions. Small veins of whitish granite also occur following the stratification which runs N. 30° W.

UNALTERED ROCKS.

The Intermediate Formation. Between Cape Jones and Cape Dufferin, the islands and a considerable portion of the mainland are occupied by newer rocks resting on the Laurentian. They consist of two series, uncomformable to each other. The upper, which I have called the Manitounuck group, after the chain of islands of the same name in this neighborhood, appears to be equivalent to the Nipigon formation of the Lake Superior region. The lower series is made up of hard, coarse grey sandstones and conglomerates, in which the pebbles are mostly of white quartz, and reddish-grey quartzites or sandstones which are generally thinly bedded. This series had been somewhat disturbed before the deposition of the upper, which is remarkably free from disturbance. The former may be equivalent to the upper part of the Huronian series of more southern latitudes.

At the first fall on the Little Whale River, the hard grey quartz conglomerate of the lower series is well displayed. On the south side of the stream, near the mouth, where the hills are upwards of a thousand feet high, about 150 feet at the base of one of them consists of coarse grey and reddish-grey somewhat altered sandstone, with conglomerate layers, and conglomerate with sandstone layers, in both of which the pebbles are mostly quartz. These form part of the lower series, which is, no doubt, much thicker than the section exposed. In the south-western part of Richmond Gulf and on the north side of its narrow outlet, a remarkable castle-like peninsula runs to a height of 700 or 800 feet. The lower part consists of the coarse grey sandstone, passing into conglomerate with white quartz pebbles and belongs to the older series, while the upper part consists of limestones, slightly unconformable to the sandstones and all capped with columnar trap which resembles the walls of a castle. On the south side of the outlet of the gulf, a section of nearly a thousand feet is exposed, of which the lower four hundred or so consist of the coarse greyish sandstones of the lower group. Reddish-grey and mostly thinly bedded quartzites of this group, occur upon some of the islands and on the south-eastern shores of the gulf. I have proposed to give to this lower group the name of the Intermediate Formation. (See Transactions of the Royal Society of Canada for 1884, p. 242.)

The Nipigon Formation.—The islands from Cape Jones to Cape Dufferin and the shores of the mainland from Manitounuck Sound to a point thirty miles north of the entrance of Richmond Gulf consist of a series of unaltered stratified rocks, in none of which could fossils be found. They are probably of the same age as the Nipigon formation, but until this point is definitely determined I proposed, in 1877, to call them, for convenience, the Manitounuck Group—(See Geological Survey Report for 1877, p. 11). They are made up principally of limestones, sandstones and quartzites, shales, ironstones, amygdyloids and basalts. The limestones are mostly magnesian and a large proportion of them are silicious and argillaceous. The strike corresponds with the general course of the shore and of the chains of islands near to it. The dip is at a low angle towards the sea. Glaciation has taken place from the eastward, and as a consequence of these two circumstances, all the escarpments of the islands are on the landward side, and those on the main shore all face inland. Many of the latter rise to heights of 700 feet or more above the level of the sea. The limestones, which are mostly bluish-grey, are generally found at the base of the series. They usually occur in thick beds and contain cherty concretions having a concentric structure. The quartzites and sandstones come next in ascending order and they also occur in massive beds. Their color varies from light to very dark grey, and a few beds are reddish. Associated with and overlying the quartzites is a series of cherts and shales which are mostly darkly colored. These are surmounted by a

great thickness of amygdaloids of various kinds and by diorites of a basaltic character. The last mentioned rocks occur in patches on Long Island, near Cape Jones, and as an almost continuous capping on top of the islands of the Manitounuck chain. From Manitounuck Sound to Richmond Gulf, the main shore consists of very massive beds of amygdaloid, while the underlying basalts, shales, quartzites and limestones appear in the cliffs at a greater or less distance inland.

Further north, the Nastapoka and Hopewell chains of islands consist of quartzites and shales with ironstone bands, capped by basaltic diorites in some places. The general run of all these rocks is interrupted by numerous very low transverse anticlinals. Under the powerful glacial denudation, to which the whole of these shores have been subjected, the effect of this structure has been to allow of the cutting out of the channels which separate the islands from one another, and also to give to each of them its crescent-like form with its convex side towards the main land. The gaps through which Little Whale River and other streams in the vicinity find their way to the sea, and the outlet of Richmond Gulf, have also had a similar origin. There are also many similar gaps in the hills, which were occupied by water, when the sea stood at higher levels, but which are now more or less filled up with sand or shingle and some of them are elevated to considerable heights above the water.

The following approximate section of the rocks on the south side of the outlet of Richmond Gulf, measured from the level of the sea upward, may be taken as a fair representation of the rocks which form the high and narrow tongue of land which separates the gulf from the open sea and also of the first ridge or range of hills all along the coast to the southward as far as the head of Manitounuck Sound:

	Feet.
Coarse grey sandstones, of the Intermediate Formation, upwards of	400
Amygdaloids	150
Bluish-grey and drab dolomites	60
A band of bluish drusy dolomite, carrying galena	20
Thick-bedded bluish dolomite	30
Grey quartzites and argillites	100
Basaltic diorite (followed elsewhere by amygdaloids)	200
	960

Everywhere on this part of the coast, the Manitounuck, series dips to the westward at a uniform angle of about 5°. The upper beds, which slope under the water all along the outside shore of the narrow peninsula between Richmond Gulf and the Bay, consist of amygdaloids, and the same rocks continue along the coast to the southward nearly to Manitounuck Sound. They are usually thickly studded with coarse agates, many of which are very large. A striking feature of these amygdaloids consists in the frequent occurrence in them of large isolated masses of green epidosite, from two to twenty feet in diameter. These masses appear to be of a seggregated or concretionary character. The proportion of the epidote which they contain, and the intensity of the green color gradually increase from the periphery to the centre of each mass. On the extensive bare rock-surfaces along the sea shore they generally break up, under the weather, into angular fragments which become removed by some natural process, in which frost, no doubt, plays an important part, leaving round pits or holes to mark the former positions of the epidotic masses.

The lead-bearing band of dolomite in the above section is worthy of notice. In the cliffs about three miles to the north-east of the Hudson's Bay Company's post at the mouth of Little Whale River it is about thirty feet thick. Here a quantity of galena had been extracted from it long ago by unknown persons and about nine tons of the dressed ore were sent to London and sold by the company in 1858-59.

The ore occurs in the form of isolated bunches in the dolomite. On the south side of the river and near the Hudson's Bay Company's post, this band appears to be richer in galena than where it has been worked. It is traceable thence to Richmond Gulf, at the entrance to which, on the south side, I found bunches of galena in it which would weigh upwards of one hundred pounds. The same band appears to be exposed in the cliffs along the west side of the Gulf. Although comparatively thin, it is probably continuous between the localities which have been mentioned, as both it and the associated beds are very regular, and from its richness in lead ore it may in some parts of its course, prove of economic importance. Dr. Harrington found specimens of the ore from the old "mine" near the Little Whale River post to contain 5.104 ounces of silver to the ton of 2,000 pounds, while that from the entrance to Richmond Gulf yielded him 12·03 ounces to the ton.

The Manitounuck rocks are continued northward in the Nastapoka chain of islands, which begins near Little Whale River and runs northward, parallel to the coast, for about ninety miles. It consists of fourteen principal islands, all of a crescent-like form, narrow and destitute of trees and arranged in a single row, lying at a distance of from two and one-half to five miles from the coast. Four of the larger islands are each ten miles long. They all present nearly the same structure, with cliffs on their eastern sides facing the mainland, and the strata of which they are composed dip westward or towards the open sea at angles varying from 3° to 6°. The following ascending approximate section of the beds on the southernmost large island of the chain and which we called Bélanger's Island, may be taken as representing, in a general way, the rocks of the whole chain. (See Geological Survey Report for 1877, p. 6 C.)

	Feet.
Bluish dolomite, weathering yellow, all in large concentric masses, with olive green slate between. These large masses are themselves formed of small concentric concretions from 2 to 6 inches in diameter..........................	10
Olive green silicious slate..	20
Interval of coarse shingle, 30 or 40 chains wide, between the eastern edge of the island and the base of an east-facing cliff, in which the rest of this section is exposed. The strata concealed would be about..............................	200
Greenish silicious shale with grey quartzose sandstone	150
Single band of light grey sandstone..............................	10
Grey quartzose sandstone, interstratified with greenish silicious shales..	105
Black slate, some of which splits into good flags.................	15
Highly ferruginous impure dolomite band..........................	10
Drab-colored manganiferous spathic ironstone in thin bands, some of which weather to a brown color, others to a black. These form much of the surface of the island......	18
	538

The greater part of this section is seen in a cliff rising nearly perpendicularly to the height of 348 feet above the sea. The manganiferous iron-stone band, which forms the upper member of this section, is of great economic importance. It also appears to form the summits of nearly all the other islands of the chain. On Flint Island, the small southernmost member of the group, this band is 30 feet thick, but it is here interstratified with beds of greenish argillaceous sandstone. On Davieau's Island, about sixty miles north of the inlet of Richmond Gulf, the ore band is about 20 feet thick.

Analyses of specimens from this spathic ironsto   Dr. B. J. Harrington, show that it contains valuable ores of iron and manganese. An average specimen of a compact variety from Flint Island was found to contain 25·44 per

cent. of metallic iron and upwards of 24 per cent. of carbonate of manganese. A crystalline variety from Davieau's Island gave 27·83 per cent. of metallic iron. The average thickness of the iron band is probably not less than twenty feet, and it appears to run through all the islands of the group, a distance of about 90 miles, exclusive of the more northern members which are more widely separated. The band is made up of layers a few inches in thickness. The color, on fresh fracture, presents various shades of drab, buff and brown, and the weathered surfaces are either black or some shade of brown. The ore beds may not be all equally rich, but the greater part of them on the various islands visited appear to be sufficiently so to constitute a valuable ore for the manufacture of spiegeleisen. The abundance of the ore is its great feature. Forming the uppermost band on nearly all these large islands, where the dip is so low and the underlying strata confined to the cliffs along their eastern sides, the ironstone beds are spread over the greater part of their areas, which in the aggregate amounts to many thousands of acres. The islands being destitute of timber and the rocks much shattered by the surface water and the frost, the ore, ready broken, may be gathered up in inexhaustible quantities. The islands offer good shelter for vessels and the ore might be conveniently loaded in many places.

In connection with the subject of iron ores on the Eastmain coast, it may be here stated that along the south-east or landward side of Long Island, for a distance of three miles from its south-western extremity, highly ferruginous beds, varying from ten to fifty feet thick, some of which may be valuable as ores of iron, are seen near the water's edge, overlying sandstones and shales and underlying compact trap. On an island about one mile long and situated half a mile south-west of the southern extremity of Long Island a ferruginous band is seen in a similar position and another one higher, between two thick layers of trap. Loose masses of a shaly, somewhat argillaceous bright red hematite were found along the coast in the vicinity of Richmond Gulf. These may have been derived from some of the red bands interstratified with the sandstones, quartzites, &c., among the lower strata around the gulf. Magnetic iron-sand is washed out of the drift in considerable quantities at various places along the eastmain coast, such as Great and Little Whale Rivers, near Little Cape Jones and Langlands River. (Report Geological Survey for 1877, p. 21 C.)

The thickness of the strata of the Manitounuck group of rocks on the mainland and islands in the vicinity of Nastapoka Sound, may be approximately computed from their angle of inclination and their horizontal width at right angles to the strike. As the strata of the Nastapoka Islands and of the mainland opposite are almost undisturbed, and as both have the same moderate dip, the average strike being parallel, it may be assumed that the measures concealed under Nastapoka Sound are conformable to both, and they would, therefore, amount to about 1,000 feet in vertical thickness. This, with a minimum of 1,200 feet to represent the strata around Richmond Gulf (exclusive of the underlying Intermediate Formation) and 600 feet for the rocks of the Nastapoka Islands, would give a total of 2,800 feet as the thickness of the whole Manitounuck group on this part of the coast.

The Nastapoka chain of islands is continued northward by an island over seven miles long, the south end of which is a short distance beyond the mouth of the Langlands River, and by a somewhat smaller island some fifteen miles further north, both islands lying about two miles off the shore. These two islands and the northern half of the most northern one of the Nastapoka chain proper, are capped by a considerable thickness of trap, which would apparently occupy a higher place in the series than any of the strata of the islands to the southward.

In going northward, the rocks of the Manitounuck group, above described, terminate on the mainland about thirty-one miles north of the entrance to Richmond Gulf, and beyond this point the Laurentian gneiss forms the main shore all the way to Cape Dufferin.

Hopewell Point, which is situated at a distance of about thirty-one miles northward of the last two islands just described, is a much less conspicuous geographical feature than was formerly represented on the imperfect charts of this coast. The

Hopewell chain of islands consists of ten principal members, lying between this point and Cape Dufferin. They resemble the Nastapoka Islands in geological structure and in their forms and general appearance, but they are not so high and most of them lie closer to the mainland, the narrow channel behind them being called Hopewell Sound. They are composed of a single group of rocks which runs through the whole chain and appears to be equivalent to the upper strata of the Nastapoka Islands. The following approximate ascending section which is exposed on the landward side of the first large island of the series, at a point two miles north-west of the extremity of Hopewell Point, will serve as an example of the character and superposition of the rocks of the entire chain :

	Feet.
Black slate	30
Dark grey thinly-bedded sandstone	30
Massive light grey sandstone	10
Black shale with two bands of dark grey quartzite, and one band three feet thick, of iron-stone	40
Fine-grained dark greenish-grey trap (maximum of this locality)	40
	150

All the islands of the group have a structure resembling the above section, but the relative proportions of the different strata vary somewhat in passing from one to another.

The remainder of the east coast of Hudson's Bay, from Cape Dufferin to within about thirty miles of Cape Wolstenholme, has not yet been examined geologically. I have seen numerous pots and lamps made from a greenish-grey compact steatitic rock, in the hands of the Eskimo, which they said they obtained in the neighborhood of Mosquito Bay. This circumstance indicates the probable existence of a band of Huronian rocks in that part of the coast. The description of the shore from Cape Dufferin to Mosquito Bay, by those who have seen it, leaves little doubt that it consists mainly of Laurentian rocks.

Last September, while the "Alert" was lying in Laperriere's Harbor in Outer Digges Island, I was afforded an opportunity of coasting southward in a whale boat to a point about thirty miles from Cape Wolstenholme. From the tops of the rocky hills at this distance I could see the nature of the land for at least ten miles further south. The whole country from the cape consists of barren hills of Laurentian gneiss of the commoner varieties, with patches of fine-grained red granulite, of limited extent, in some parts. Large veins of white quartz and red felspar were noticed occasionally. Judging from the appearance of the land still further south, as seen from the "Neptune" in 1884 and from the "Alert" last year, the coast would appear to maintain the same character all the way to Mosquito Bay; so that we have reason for believing that the Laurentian rocks prevail along the entire coast, between Capes Dufferin and Wolstenholme. As stated in my report of last year, Nottingham Island and the Digges Islands also consist of Laurentian gneiss, as well as both shores of Hudson's Strait at every place where they were examined.

In the eastern part of Hudson's Bay, a number of groups of islands occur between the latitudes of 56 and 60 degrees, and at distances varying from 70 to 100 miles from the Eastmain coast. I have obtained, through the Eskimo, a few rock-specimens from the islands opposite to Little Whale River, from which I infer that trappean rocks occur there. One of the specimens is a large piece of calcite from a vein.

The most northerly group of the islands referred to lies in a north-easterly and south-westerly direction, and mostly between latitudes 59° and 60°. We visited them last autumn, in the "Alert," and a rough survey was made of a part of the group, which was named the Ottawa Islands, in order to avoid confusion in reference to the

two groups called the North Sleepers and the South Sleepers which are the next islands to the south of them. The Ottawa Islands are all of a bare mountainous character and rise to heights of between one and two thousand feet above the sea.

I landed upon one of the outermost of this guoup and found it to consist entirely of a greenish trappean rock, apparently diorite. The rocks of most of the islands in the northern part of the group had exactly the same appearance and they are, no doubt, of the same geological character, but the most westerly of the larger of these islands to which we approached close enough to see it plainly, consisted of stratified masses in distinct layers of great thickness and of different colors and external appearance, all dipping westward or towards the centre of the bay. The trap of the island on which I landed was cut by small veins of quartz containing copper pyrites, and it also held thin short seams of asbestus.

In 1884 I had opportunities of landing from the "Neptune" at two places on the eastern shore of Mansfield Island, and the greater part of this side of the island was seen sufficiently closely to ascertain that it consisted of greyish limestone in horizontal beds which were mostly thin. Although the fossils collected on the above occasions are neither numerous nor good, they are sufficient to show that these limestones belong to the Silurian system and are probably of the age of the Niagara formation.

As stated in my report for 1884, I had an opportunity of inspecting the south-eastern side of the southernmost island of the Southampton group for a considerable distance northward from Cape Southampton. In this interval the rocks consist of limestones, like those of Mansfield Island on the opposite side of the ship channel. Last season, Captain Wm. Hawes, of the Hudson's Bay Company's brig "Cam Owen," informed me that the northern end of this island, for a distance of 25 to 30 miles southward from Cape Pembroke, consists of rugged rocks, forming dark-looking hills, which he could not distinguish from those of Laurentian gneiss on both sides of Hudson's Strait.

WEST SHORE OF HUDSON'S BAY.

From what has been ascertained in regard to the geology of the western shores of Hudson's Bay, including James' Bay, it appears probable that they are everywhere bordered by rocks newer than the Laurentian, except, perhaps, in the vicinity of Cape Henrietta Maria, where there is an interval concerning which but little is yet known, and in which the latter system may come to the coast.

A large area, lying immediately to the south-west of James' Bay, is occupied by almost horizontal fossiliferous strata of Devonian and Silurian age. These rocks form a flat country, which rises very gradually as we advance into the interior. They extend further inland on the Albany River and its great southern branch, the Kenogami, than in any other part, the margin of the basin being 200 miles from the bay on the former, and 230 on the latter. The dip is north-eastward or towards the bay at a low angle. On the southern side of this basin, which begins about Hannah Bay, the Devonian rocks come into direct contact with the Laurentian and Huronian, but in the valley of the Albany a considerable breadth of Silurian limestones and marls is interposed. The late Mr. Billings considered that the fossils, which I collected in this valley, indicated the Niagara formation.

The Devonian rocks are exposed along the main Moose River and the lower parts of its branches, the Abittibi, the Mattagami and the Missinaibi, as well as on the Albany and the Attawapishkat. The late Mr. George Barnston collected and presented to the Geological Survey a number of well-preserved fossils from the two streams last named; and others have been brought by myself from the Moose and its branches, which Mr. Whiteaves considers to indicate the Corniferous formation, while the fossils from the Albany and the Attawapishkat, he finds, belong to the Hamilton group. These Devonian rocks include greyish limestones with ironstone, bluish-grey shales with gypsum, and reddish marls. Agoomska Island, and some

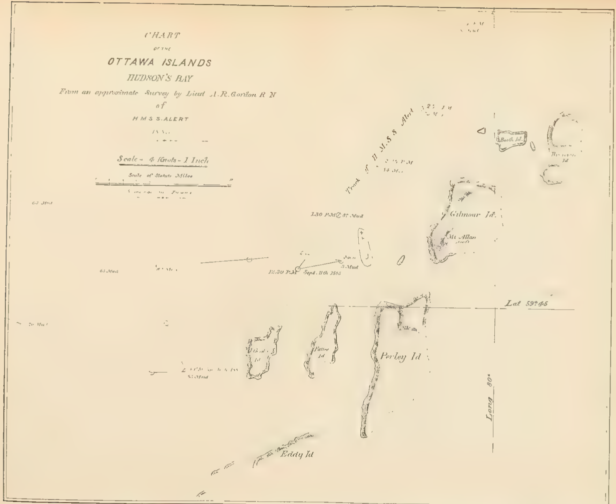
CHART
OF THE
OTTAWA ISLANDS
HUDSON'S BAY
From an approximate Survey by Lieut A.R. Gordon R N
of
H M S S. ALERT
Scale of Statute Miles
Track of H.M.S.S. Alert
Booth Id.
Gilmour Id.
Mt Allan
1.30 P.M.
Sept. 11th 1885
Perley Id
Eddy Id
Lat 59°45
Long 80°

smaller islands in James' Bay, probably consist of Devonian strata also, as the general dip is in their direction, and it is possible somewhat higher measures may occur on these islands. A large deposit of good clay ironstone, passing into limonite, which occurs in the Devonian rocks at the foot of the Grand Rapid on the Mattagami River, and the probable occurrence of other deposits in these strata will be described in a separate chapter on the Económic Minerals of Hudson's Bay. The gypsum associated with these rocks at the "White Banks" on the main Moose River, from 31 up to 38 miles above Moose Factory, will also be described in the same chapter.

Westward from Cape Henrietta Maria, or following the south side of Hudson's Bay proper, the Indians describe the country, a short distance back from the shore, as being somewhat hilly to a point, a few miles east of the Wainusk River, where it becomes level, and continues so all the way to the Nelson River and beyond. In 1880, the Bishop of Moosome brought me a specimen of light-colored fossiliferous limestone from the rock *in situ* in the bed of the River Severn, at a point about twenty-five miles above the Fort of the same name. He reported this limestone as abundant in this part of the river, and, from his description of the character of the stream and of the surrounding country, it appears probable that this rock may extend to twice the above distance or more from the sea. In following the boat-route inland, from York Factory, by way of Hayes, Steel and Hill Rivers, the Laurentian rocks are first met with at about six miles below "The Rock," which is the first chute on Hill River, and is situated at a distance of 109 miles, in a straight line, from York Factory. The intervening country is level, and it has all the characters of the regions along the lower stretches of those other rivers of Hudson's Bay, on which the Palæozoic rocks are known to occur. The river in its three sections just named, is broad, and flows with a swift and almost uniform current over limestone shingle, which is no doubt derived from flat-lying Silurian rocks under the drift, out of which the bed of the stream is excavated. On this boat-route, therefore, it may be inferred that the Silurian rocks extend inland to a distance of about 103 miles, in a straight line from York Factory, or about 108 from the extremity of the point between Hayes and Nelson River. (See Report Geological Survey for 1878, p. 8 C. C).

On the Nelson River the flat-lying Silurian rocks were ascertained to extend inland to a distance of eleven miles above the Third Limestone Rapid, or as nearly as possible 108 miles in a straight line from the extremity of the point between the Nelson and Hayes Rivers, called Beacon Point or "Point of Marsh." The beds highest up the river contain abundance of fossils which prove them to be of Lower Silurian age, but those nearest the sea are probably Upper Silurian. The latter consist of dolomites, and in ascending the river they were first found about two miles above the Puck-wa-ha-gun branch, or at sixty-two miles in a straight line from Beacon Point, where they are exposed at low water on both sides of the stream. The same rock was also met with on the south-east side of the river at two and six miles further up. At the latter place a perpendicular escarpment of it rises out of deep water to a height of thirty feet above its surface. At all of the foregoing localities the rock has a yellowish-grey color, is rather fine grained, soft and generally earthy, although some of the beds appear to constitute a tolerably pure dolomite. It is thinly bedded, with the exception of a few bands, a foot or more in thickness, at the last locality. The only fossil observed was a *Pentamerus*, which was abundant in one of the beds, but none of the specimens were sufficiently well preserved to identify the species with certainty. (Geological Survey Report for 1878, p. 12, C. C.)

The foot of the First or Lowest Limestone Rapid on the Nelson River, which may be considered the head of steamboat navigation, was found to be about 77 miles in a straight line from Beacon Point, or about 90 miles by the river, and to be in latitude 56° 36′ 6·1″ Here on the north-west side is a cliff of buff colored fossiliferous dolomite in nearly horizontal beds. It is shaly at the base, but at the top some of the beds are two feet thick and the latter hold flinty and white chalky nodules. The fossiliferous rocks crop out here and there on the sides of the river for a distance of 23 miles above the foot of the First Limestone Rapid, or to a point

three miles above the Third Limestone Rapid. On thesouth east-side, just below the Second Limestone Rapid, nine miles above the first, a cliff, twelve feet high, at the edge of the river, is formed of horizontal beds of crumbling buff and greyish dolomite. At about a mile below this locality these beds were observed to be slightly undulating. At the Third Limetone Rapid the rock is exposed in horizontal beds at the foot of the clay bank along the south-east side of the river, and consists of bluish grey, drab and buff somewhat arenaceous dolomite. The Limestone River, a considerable stream from the northward, enters the Nelson just below the foot of this rapid. The last exposure of fossiliferous rock which was seen in ascending the river occurs on the south-east side at the foot of the Broad Rapid, about eleven miles above the Third Limestone Rapid, or 108 miles from Beacon Point. It consists of a finely arenaceous dolomite of a mottled light bluish-grey color. The fossils collected at the three Limestone Rapids were examined by Mr. Whiteaves, who found them to comprise most of the species characteristic of the dolomite which occurs along the Red River in Manitoba, and which he regards as equivalent to the lead-bearing limestone of the Western States, or about the horizon of the Utica formation of the Lower Silurian system.

In desecening the Churchill River, the Silurian basin is entered upon at a distance of 80 miles, in a straight line, from the mouth of the stream. The beds first met with consist of rather coarse greyish rusty-looking sandstone, which is seen here and there in the banks of the river, resting on coarse syenitic gneiss, for a space of three miles, or to the seventy-seventh mile from the sea, where we come to Portage Chute, the strongest rapid on the river below the junction of the Little Churchill. The greatest thickness of this sandstone exposed in any one place amounts to about thirty feet. It was not observed to contain any fossils. From Portage Chute, for the next forty-two miles, or to within thirty-five miles of the mouth of the river, Silurian strata are met with, either continuously or at short intervals in the banks or bed of the stream. The last of the red syenitic gneiss, which prevailed higher up the river, is seen in its bed at a distance of eight miles below Portage Chute, but on the left or west bank, a cliff of greyish-buff very crumbling earthy limestone or calcareous marl, varying from thirty to fifty feet in height, extends all the way from the Chute to this exposure of gneiss, and the same rock is also seen at intervals beneath the drift clay in the opposite bank. Similar dolomites, but becoming less earthy as we descend the river and rise in the measures, continue to a point five miles below the commencement of the last or forty-five mile reach of the river, or as above stated, to within thirty-five miles of the mouth. Some of the more strongly dolomitic or least marly of the beds are mottled with white chalky nodules like those already referred to in the dolomites of the Nelson River, while others have straggling dark-colored patches running over their surfaces. The dolomites of the last five miles are more evenly bedded and of a lighter grey or buff color than those further up. The few fossils which were observed in the dolomites and marls of the Churchill appear to belong to Lower Silurian species. (See Report Geological Survey for 1879. C.)

Below the last exposure of these dolomites (at thirty-five miles from the sea) no fixed rocks were observed until approaching Mosquito Point on the west side at the head of tide-water; where, at a short distance back from the river, massive dark grey argillaceous quartzites are exposed in a ridge running in a southerly direction. These Churchill quartzites contain no fossils and they evidently belong to a much older series than the dolomites. They bear a strong resemblance to the auriferous "whin-rocks," of Nova Scotia, and, like them, contain veins of quartz, which, however, did not show any gold in half a dozen specimens assayed by Mr. Hoffmann. The fine harbor in the mouth of the Churchill River owes its existence to these quartzites, which form the sea coast on either side of it. They were also traced for several miles to the eastward. The Silurian dolomites are, however, again met with on the coast several miles south of Cape Churchill.

Northward of Churchill River I have explored the shore of Hudson's Bay for a short distance beyond Button's Bay and have seen the land in places on the north-

west side, but Marble Island was the only part in this direction of which I have personally made a geological examination. I have, however, been furnished with descriptions of the whole coast as far as Chesterfield Inlet, by friends who have travelled along it, and have also received from them considerable collections of specimens of the fixed rocks from a number of places between Eskimo Point and Chesterfield Inlet. Professor James Tennant has also described some rock-specimens from the same part of the coast and Repulse Bay. From these data some idea may be formed of the geology of the whole north-western side of Hudson's Bay.

It would appear that from Seal River to Eskimo Point, a distance of 140 statute miles, the coast is low with the exception of an occasional isolated hill, probably of drift. There is much limestone in the shingle of the beach, and it is not improbable that behind this section of the shore, the flat-lying Silurian rocks form a considerable area similar to those which have just been described further to the south-east. The unbroken or even trend of the shore, like that from Cape Churchill to the Severn River, as well as the low character of the land would, from analogy, indicate the presence of these rocks rather than of the older formations, which would probably give rise to a hilly country and a broken coast line.

From Eskimo Point to Chesterfield Inlet the rocks would appear to consist principally of a variety of schists, which cannot be distinguished from those we have classed as Huronian. Among the specimens from this region are amygdaloids and other trappean rocks, and likewise one of red sandstone which has the peculiarities of that of the Intermediate Formation mentioned in a previous part of this chapter as occurring in Richmond Gulf. The geology of Marble Island is described in my report for 1884. Glossy mica schists, like those associated with the quartzites of which the island is mainly composed, are also found on the mainland opposite. Between Eskimo Point and Chesterfield Inlet, the natives report the occurrence of numerous large veins of granular iron pyrites, of which I obtained a dozen freshly broken angular specimens, having a total weight of about fifty pounds. The only rock associated with the pyrites is a very small quantity of dark greenish soft schist. A specimen of this kind of pyrites which I obtained from Iñari on this coast in 1879 had adhering to it a small quantity of light bluish-grey magnesian limestone. In my, report for 1884, I stated my belief that "a set rocks very like those of the Township of Ascot (celebrated for its mines) in the Province of Quebec, and holding similar pyrites veins, which are of great economic value, will be found in this part of the western coast of Hudson's Bay." Similar pyrites veins in rocks such as these, have, on working them, been frequently found to contain a profitable percentage of copper, which has generally had a tendency to increase in amount in proportion to the depth from the surface. The specimens from Repulse Bay, described by Professor Tennant, belong to the commoner varieties of the Huronian series, and it would not be surprising if these rocks prevailed all along the coast from Chesterfield Inlet to this bay. The occurrnce of specks of gold in quartz from Repulse Bay, mentioned by Tennant is interesting. The Eskimo report finding mica in wide sheets in the interior of the country opposite to Marble Island, and some years ago it was said that an American vessel took a large quantity of this mineral from Chesterfield Inlet. From the foregoing data and the fact that the Huronian rocks, or such as the specimens from this region indicate, are pre-eminently the metalliferous series in the Dominion, I am convinced, as I have frequently stated elsewhere, that we have on the north-western side of Hudson's Bay a promising region for economic minerals.

THE ECONOMIC MINERALS OF THE HUDSON'S BAY TERRITORIES IN GENERAL.

The useful minerals which have as yet been discovered near the shores of Hudson's Bay or Strait have been already mentioned in describing the geology of these regions in a previous chapter. But in connection with the subject of this report, it is

believed that a very brief account of what is known of the mineral resources of the Hudson's Bay Territories, generally, will prove interesting. These notes have been gathered partly by myself in the course of the geological explorations which I have made in various parts of these territosies, and part of them are derived from the published observations of other travellers who have visited these regions. The Hudson's Bay Territories include the greater portion of the Dominion of Canada north of the watershed of the St. Lawrence and east of the Rocky Mountains. It will be seen that notwithstanding the small amount of exploration which has been made for valuable minerals in this vast region, we have indications of great wealth in various directions. A few words on the outlines of the geology of the territories under consideration will assist in explaining the distribution of the economical minerals.

The Laurentian nucleus of the continent is the principal feature of the geological map of the Dominion. It stretches from Lake Superior to Baffin's Bay, and from Great Bear Lake to the Straits of Belle Isle. Hudson's Bay itself, which is half the size of the Mediterranean Sea of the old world, lies in the centre of this area. Its shores are bordered in places with newer rocks. On the west side of James' Bay (its southern prolongation) these extend inland over 200 miles, and consist of fossiliferous Devonian and Silurian strata. On the western and north-western side of Hudson's Bay, proper, altered rocks are met with, some of which resemble the gold-bearing strata of Nova Scotia, some the Huronian of Lake Huron, some the older Huronian, and others the crystalline series of the neighborhood of Sherbrooke, in the Province of Quebec.

Along the east coast (called the Eastmain), and among the islands lying off it, there is an interesting set of volcanic and sedimentary rocks, which appears to be identical with the Animikie and the Nipigon series of Lake Superior.

The area which I have spoken of in a general way as being Laurentian includes tracts and belts, more or less extensive of the Huronian series. Such areas appear to be most common, and they have been best explored in the country between the Great Lakes and Hudson's Bay.

Most of the islands of the Arctic Sea consist of Silurian strata. On some of the north-western of them, Carboniferous rocks are supposed to be developed, but, possibly, on further examination, these may prove to be Devonian and Cretaceous; and still further north, strata supposed to be of Liassic age have been found.

Between the Laurentian nucleus and the Rocky Mountains, there is a great basin of Silurian, Devonian, Cretaceous and Tertiary rocks, which, towards the Arctic Ocean, becomes, to a great extent, replaced by non-fossiliferous limestones, probably of Nipigon age. On the shores of the Artcic Ocean, similar limestones, associated with trap, are the prevailing rocks between the Mackenzie and Copper Mine Rivers. The copper-bearing rocks of the latter river appear to correspond with those of Lake Superior.

In the following brief account of the economic minerals, I shall begin with the metallic ores, and in order to make this part of the subject as complete as possible, I shall include in it short notices of any valuable minerals which may have been already referred to from a geological point of view in a previous part of this report.

Iron.—A fine variety of magnetite, of which I procured specimens, is said to occur in large quantities near the entrance of Black Bay on the north side of Athabasca Lake. On Knee Lake, between Lake Winnipeg and Hudson's Bay, I have examined a large deposit of a laminated finely granular magnetite which however, Mr. Hoffmann finds to contain only 45.86 per cent. of metallic iron; but it is perfectly free from titanic acid. Magnetic iron ore is reported to occur on the north side of Hudson's Strait, and small deposits of it are not uncommon among the Huronian bands in various parts of the territory.

Hæmatite in bands associated with sandstones, shales and trap, is found on Long Island, Hudson's Bay; and loose pieces of this ore are often met with on the Eastmain coast. A promising deposit of hæmatite has been opened on Big Island in Lake Winnipeg. Two years ago Captain H. P. Dawson, R.A., sent me a fine

specimen of foliated specular iron from a vein on the northern bay on Great Slave Lake.

Clay-ironstone is found on Melville Island, according to Mr. Charles König (in the Supplement to the Appendix of Captain Parry's Voyage of 1819-20). Small quantities of it in the form of nodules and thin layers occur in many places in the Cretaceous and Tertiary marls of the North-West Territories. In 1875, I discovered a large deposit of this ore passing into limonite, at the foot of the Grand Rapid of the Mattagami River, a short distance south-west of the head of James' Bay. There are indications of its existence in considerable quantities in various places among the Devonian rocks to the south-west of this bay.

But probably the most extensive deposit of iron ores in the territories under description is that of manganiferous spathic ironstone on the Nastapoka Islands, on the east side of Hudson's Bay, described in my report for 1877. As stated in a previous part of the present report, the ore occurs as a thick band, divided into layers of a few inches overlying the quartzites and shales, and running through all the islands of the southernmost ninety miles of this chain. The dip of the strata is low and the ore, broken up by the frost, forms much of the surface of these islands, there being no timber or soil. Dr. Harrington has analyzed specimens of the ore from different islands, and found it to contain on an average about 50 per cent. of carbonate of iron and 25 per cent. of carbonate of manganese. It would, therefore, be a valuable ore for the manufacture of spiegeleisen.

Copper.—The native copper of the Copper Mine River is described as occurring in amygdaloid, and from private accounts, which I have heard, it would appear to exist in large quantities. I have found small veins containing copper pyrites on Long Island and one of the Ottawa Islands in the north-eastern part of Hudson's Bay. As a set of rocks resembling the copper-bearing series of Lake Superior are largely developed on these islands and the Eastmain coast, copper may be here looked for with a prospect of success. Some of the specimens of granular iron pyrites, which I have obtained from the north-west shore of the bay, look as if they contained a small percentage of copper. The quartzites of Marble Island are stained with the green carbonate in some places. Copper pyrites, generally in small quantities, has been found in the Huronian rocks in various parts of the territories. It occurs mostly in quartz veins, resembling those of the Bruce mines on a small scale. At this locality, which is on the north shore of Lake Huron, two quartz veins in Huronian greenstone yielded sulphuretted ores to the value of $3,300,000 between the years 1847 and 1875. On the Mattagami River, about 25 miles below Kenogamissee Lake, I have found calcspar veins from three to ten inches thick cutting similar dioritic and containing specks of copper pyrites. A promising deposit of the latter was described by the late Mr. James Richardson some miles southward of the now celebrated Lake Mistassini. Captain Sir John Ross says he "found copper ore near Agnew River and Lord Lindsay River," but he does not state what variety of ore it consisted of.

Lead.—Among the rocks of the Manitounuck series, on the east side of Hudson's Bay, a band of drusy bluish grey dolomite, about twenty-five feet thick, was found on both sides of Little Whale River and at Richmond Gulf. This band contains a good deal of galena in the form of bunches, some of which would weigh about 100 pounds. Galena has been found by Mr. E. B. Borron in veins in Huronian rocks at Lake Mattagami, in the southern part of the basin of Moose River.

Zinc, in the form of blende, is found in small bunches among some of the rocks of the Manitounuck series. Large workable masses of blende occur north of the Battle Islands, Lake Superior, in hornblende schist.

Molybdenum.—A specimen of molybdenite was presented to me at Great Whale River, which was said to have been found in the neighborhood. Specks and scales of this mineral are not uncommon in viens in the Huronian series.

Silver.—The galena of Richmond Gulf was found by Dr. Harrington to contain twelve ounces of silver to the ton of 2,000 pounds of ore. The same gentleman found silver in small quantities in the iron pyrites from a vein in gneiss near the mouth of Great Whale River, and in the same mineral from another vein cutting dolomite

near Cape Jones. Nuggets of native silver have been found, with those of gold, in some of the upper branches of the Peace River. Copper ores, which have been discovered three or four years ago in the Rocky Mountains, near the line of the Canadian Pacific Railway contains a notable quantity of silver.

Gold.—Traces of this metal were found, along with the silver, by Dr. Harrington, in the pyrites of the two localities which have just been referred to. Specks of gold are mentioned by Professor Tennant as occurring in quartz which had been brought from Repulse Bay, which lies to the north of Hudson's Bay. At the Huronian Mine, north of the height-of-land, and west of Thunder Bay, Lake Superior, gold is found in promising quantities in a large quartz vein cutting Huronian schists, which has been worked to some extent, and a stamp-mill has been erected at the mine. It is met with as specks and small nuggets, also in a quartz vein, at Partridge Lake, a short distance northward of the last named locality. Gold has been known for several years to exist in quartz veins on Lake of the Woods and elsewhere in that section of the country. Openings have been made on some of these veins, and with a prospect of ultimate success. The most promising veins appear to be those which cut the diorites near the large masses of granite about the eastern parts of the lake. There is reason to believe, that to the west of the lower part of the Mackenzie River, a promising region for gold and silver exists. From private sources it has been ascertained that gold has been washed from the sand and gravel of some of the upper branches of the Youkon and the western tributaries of the Liard; and also of the Rat River, which enters the west side of the delta of the Mackenzie. The fine gold found in the bed of the North Saskatchewan, especially about Edmonton, is washed out of the drift, and it may have had its original source in the auriferous upper parts of the Peace or Liard valleys, having come thence during the glacial period.

Although it is probable that it will be many years before the cheaper and more bulky of the non-metallic minerals of this vast wild region will be sought after, still as we never know what circumstances may arise to make them valuable, any facts concerning them are worth recording in advance of the settlement of the country. The knowledge of their existence may sometimes prove a factor in the projecting of railways, or in otherwise promoting the development of the country.

Gypsum.—Banks of gypsum, from ten to twenty feet high, occur on both sides of the Moose River, between thirty-one and thirty-eight miles above Moose Factory, which is situated at the south-western extremity of James' Bay. The upper part is mixed with marl, and only the lower ten feet consist of solid gypsum, which is mostly of a light bluish-grey color. A small proportion is nearly white. A similar deposit of gypsum is reported to occur near the shore of James' Bay, between Moose Factory and Fort Albany. I found a fragment of the mineral last summer among the volcanic rocks of the Ottawa Islands, in the north-eastern part of Hudson's Bay. Sir John Ross reports its occurrence at North East Cape. In Manitoba an impure variety has been found in thin layers in the Cretaceous marls of the Riding Mountains, and nodules and crystals of selenite may be found in these rocks in almost any part of their distribution in this Province and the North-West territories. On the Peace River, at a place called Peace Point, about sixty miles from Fort Chipewyan, at the west end of Athabasca Lake, the cliffs, which are of Devonian age, are largely made up of gypsum. It is also said to occur in considerable quantities, a short distance westward of the natural salt deposits of Salt River, a small western tributary of the Slave River, about mid-way between Lake Athabasca and Great Slave Lake.

Salt.—At the locality, which has just been referred to, salt of excellent quality, resulting from the evaporation of brine flowing on the surface, is found in considerable quantities in crystals about the size of those of Liverpool salt. It is shovelled directly into the bags in which it is taken to all parts of the district. At a place called La Saline, about half a-mile east of the Athabasca River and thirty-five miles below its junction with the Clearwater River, a white incrustation of salt is deposited from brine flowing over a bank composed of a black indurated mixture of sand and asphalt. Excellent salt was formerly manufactured from brine issuing from Devonian

rocks at the north-western and also at the south-western extremity of Lake Winnipegosis. Springs of weak brine issue from the banks of the White Mud River above Westbourne, in Manitoba. The Devonian rocks are extensively spread in the North-West Territories, and it is to be expected that when the time comes to require it, salt will be found by boring in many localities.

Soapstone.—The Eskimo both of the north-western and the eastern sides of Hudson's Bay, as well as those of Hudson's Strait and the coast of Labrador, have been accustomed from time immemorial to make their pots and lamps out of this rock, which they find in various places among the gneisses and crystalline schists of these regions. It occurs in abundance at Red Lake, east of Lake Winnipeg and again near Falcon Island on Lake of the Woods. I have also met with it on the Mattagami River, about twenty miles below Kenogamissee Lake.

Lignite is well known to occur extensively in the Cretaceous and Tertiary strata of our North-West Territories, all the way from the United States boundary line to the mouth of the Mackenzie River. The most easterly localities are on the Souris River in Southern Manitoba, and on the Swan River near the north-west extremity of Lake Winnipegosis. The quality of these lignites varies greatly. As a general rule the nearer we approach the Rocky Mountains the better they become. Whenever the beds are disturbed or tilted, the quality is improved. Beds of lignite are found in the drift on the Mattagami, Albany and Rainy Rivers, and on the south-west side of the Lake of the Woods.

Anthracite.—In the Rocky Mountains, two beds of anthracite have been found near the line of the Canadian Pacific Railway. When on the east coast of Hudson's Bay, I was presented with a number of small specimens of a very fine variety of anthracite, said to occur on Long Island, about four miles from its southern extremity. Judging from its appearance and from the very small percentage of ash which it contains it has probably resulted from the alteration of a mineral like Albertite. (See Report of Geological Survey of Canada, 1877-78, page 24 C.) It has a bright lustre and a highly conchoidal fracture. Mr. Hoffmann found it to contain, fixed carbon 94·91, volatile and combustible matter 1·29, water 3.45, ash 0·35, in 100 parts. Some one has remarked that this anthracite has been "probably washed on shore from some vessel." Among the reasons why this could not have been the case, I may mention that up to the time of its discovery, no vessel had ever carried any anthracite into Hudson's Bay; anthracite, if thrown into the sea would sink; the composition of this mineral is different from that of any other known variety; and lastly, it does not occur on the sea-shore at all, but in the interior of the island.

Petroleum and Asphalt have long been known to occur in abundance along the Athabasca and Mackenzie Rivers. Their mode of occurrence was investigated in 1882 by the writer and described in the Annual Report of the Geological Survey of Canada for that year, pages 14 to 23 C C. The petroleum appears to come up from the Devonian limestones, and it saturates and blackens a great thickness of sandy Cretaceous strata, which immediately overlie the former, through a wide extent of country. On the Athabasca, these black asphaltic sands form banks, sometimes nearly 200 feet high, from which "tar" is constantly oozing. Thickened petroleum or asphalt has been found in various places on Great Slave Lake, along the Mackenzie River and on the Upper Peace River. It is said to have been noted also on one of the upper branches of the South Saskatchewan. The bituminous Devonian limestones of the Abitibi River, near the head of James' Bay, contain indications of petroleum.

Mica of good quality and in fair-sized sheets is found on the north side of Hudson's Straits, and specimens of it are brought by the Eskimo to every passing visitor. These people also report the existence of sheet-mica on the north-west side of Hudson's Bay, and it was said that some years ago a vessel was loaded with it at Chesterfield Inlet.

Graphite.—Eskimo from the north side of Hudson's Straits brought over specimens both of good amorphous and pure foliated graphite, and reported it to exist there in abundance. (See Report for 1884, p. 24 D D.) A fine grained variety of graphite is found near Fond du Lac, on Lake Athabasca. Plumbaginous schists, con-

taining a large proportion of graphite, have been met with among the Huronian rocks near the north shore of Lake Superior.

Asbestus.—This mineral occurs in small quantities near Little Whale River and on the Ottawa Islands in the north-eastern part of Hudson's Bay. Fine specimens of it are found in hornblende schists at Rat Portage, where the Winnipeg River leaves the Lake of the Woods, but the quantity seems too limited to be worth working. I have also obtained specimens of it from both sides of Lake Nipigon.

Chromic Iron is mentioned by Richardson as among the minerals of the northern Mackenzie River country.

Apatite has been detected near the Copper Mine River and on Trout Lake in the southern part of the baisin of Moose River. (See Geological Survey Report for 1881, page 6 C.)

Iron Pyrites.—The Eskimo of the west side of Hudson's Bay have brought me numerous specimens of granular pyrites which appear to be derived from large veins. They state that they find it in different places between Chesterfield Inlet and Nevil Bay. A mass of this mineral, apparently of workable extent, occurs on Scottie Island, in Lake of the Woods, and good specimens have been sent me from a rapid in the Mattagami River. It has been noticed in small quantities in hundreds of localities throughout the territories.

Lime.—The Devonian and Silurian limestones of the western, and the dolomites of the Manitounuck or Nipigon formations of the eastern side of Hudson's Bay, afford abundance of good stone for burning into lime. Good material for this purpose is also obtainable everywhere among the Silurian and Devonian rocks, which fringe the Laurentian nucleus all the way from Minnesota to Great Bear Lake. Irregular beds or masses of dolomites, often of considerable thickness, are found among the Huronian strata of Lake of the Woods, of Red Lake to the north of it, and elsewhere.

Hydraulic Cement.—Beds of ferruginous and argillaceous dolomite occur on some of the islands on the east side of Hudson's Bay near Great and Little Whale Rivers, which would evidently answer for calcining to form hydraulic cement.

Building Stones are abundant among the rocks which have been already mentioned as suitable for burning into lime. The walls of Fort Prince of Wales, at the mouth of the Churchill River, were faced with blocks, four feet long, by two feet thick, cut out of the grey argillaceous quartzite of the neighbourhood. The harder quartzites of Marble Island on the west, and of the Manitounuck group on the east side of the bay, occur in blocks of good shape and size for building. A handsome red granite or granulite occurs on Nottingham Island and on the east shore of Hudson's Bay, south of Cape Wolstenholme.

Glass Sand.—The pure white varieties of the quartzites last referred to would answer for glass-making. A beautiful white sand is abundant at the Methy Portage and along the Clearwater River, Athabasca district.

Fire-clays and clays for brick-making, moulding sand, shell marl for manure, ochres, peat, flagstones, roofing slates and other substances found in various parts of the Hudson's Bay Territories might be added to the foregoing list as well as various ornamental stones and rare minerals of scientific interest.

MAGNETIC WORK.

A magnetic observatory was established at Stupart's Bay station; the British Government having kindly placed at my disposal the instruments used by Captain Dawson at Fort Rae. To Mr. Whipple and the members of the Kew Committee, my warmest thanks are due for their prompt action in obtaining for us the use of these instruments.

Besides the regular series of observations carried on at Stupart's Bay, I have, whenever possible, myself taken observations to determine the absolute values of the magnetic elements.

Mr. Carpmael, Superintendent of the Meteorological Service and Director of the Magnetic Observatory, Toronto, has kindly undertaken the examination of these observations, and the following is his report:—

MAGNETIC OBSERVATIONS.

It was considered advisable that in addition to the meteorological observations taken at the various stations, a series of magnetic observations should be taken at one of the stations; with this object in view Mr. R. F. Stupart, who had had several years' experience in magnetical work, was selected to take charge of one of the stations, and he was provided with an assistant in Mr. H. Bennet. In order to obtain a set of instruments at short notice, Mr. G. M. Whipple, Director of the Kew Observatory, London, England, was written to with a view to get a loan of the instruments that had been used by Captain Dawson at Fort Rae in connection with the International Arctic explorations. Mr. Whipple promptly obtained the necessary sanction for loaning these instruments, but reported that the balance magnetometer was so defective as to be absolutely useless without a considerable amount of repairs for which there was no time. An inclinometer which had been recently invented by myself was hastily constructed in Toronto and added to the equipment, which in some measure supplied the want of the balance magnetometer.

As has already been stated in a previous portion of this report, Mr. Stupart with Messrs. Bennet, McDaniel and Chapman was located in Prince of Wales Sound in latitude 61° 34' 23" north, longitude 71° 31' 42" west.

The differential instruments were placed on pillars of artificial stone sunk four feet in the earth in a detached building, 16 by 12 feet, at a distance of about thirty yards south of the dwellinghouse, and a second house was provided in the shape of an octagon, each side three feet six inches, inside measurement, in which to make the absolute determinations. This second house was about twenty-five yards south-west of that for the differential observations.

The arrangement of the differential instruments was as follows:—

The declinometer was placed a short distance in front of the centre of the wall opposite to the door, and the bifilar magnetometer and induction inclinometer were placed near the two corners at the opposite side, so that the three instruments were at the angles of an isosceles triangle. The distance from the declinometer to either the bifilar or inclinometer was about nine feet, whilst that between the bifilar and inclinometer was about eleven feet.

The building was so placed that a line joining the declinometer and the bifilar lay almost in the magnetic meridian with the declinometer to the north, and a line from the declinometer to the inclinometer pointed south of west, magnetic.

The declinometer consisted of a magnet (cylindrical, 3 inch by 0·3 inch) with a mirror attached, suspended by a silk thread, with the reading telescope and scale all on one stand.

The bifilar magnetometer was similar to the declinometer, except that it was provided with a bifilar instead of a unifilar suspension. Both these instruments were used by Capt. Dawson at Fort Rae.

The inclinometer was a bifilar magnetometer, with this modification that instead of the magnet being retained in position nearly at right angles to the magnetic meridian by the longitudinal tension and torsion of the suspension threads, it was so adjusted that when in a position nearly at right angles to the meridian the couple, caused by the tension and torsion of the threads, vanished, with the inclination at nearly its mean value; but the magnet was maintained in this position by the action of two vertical soft iron bars, one placed magnetic north and the other magnetic south of the centre of the magnet, with the north pole of one and the south pole of the other in the same horizontal plane with and equidistant from the magnet.

The adjustments of this inclinometer were effected as follows:—

(1). With the soft iron bars away, the times of vibration T_1 and T_2 of the magnet suspended with the bifilar suspension, in the meridian, with the N end pointing north, and with the N end pointing south, respectively, were determined. The horizontal component X_1 and X_2 of the earth's magnetism as determined by the bifilar Magnetometer at the times when these vibrations were taken, being noted.

(2). An unmagnetized brass bar was substituted for the magnet and the torsion circle turned through a right angle; the mirror was then turned to a convenient reading I_0 near the centre of the scale.

(3). The magnet was then replaced in the carriage with its north end in that direction, which caused a decrease in scale reading from the position with the non-magnetic bar.

(4). The soft iron bars were then placed one to the north and one to the south of the magnet, so that the line joining the lower pole of that to the north and the upper pole of that to the south, was in the magnetic meridian and passed through the centre of the suspended magnet, and were adjusted to such equal distances from the magnet as brought the reading of the scale to nearly I_0. When E, θ were total force and dip respectively suppose I_1 be the scale reading, α the angular value of one division of the scale. The intensity of the induced magnetism is proportional to $E \sin \theta$ and the couple due to it, acting on the suspended magnet, is proportional to $M E \sin \theta$, where M is the magnetic moment of the magnet. Let us call this couple $\mu M E \sin \theta$. The horizontal couple due to the direct action of the earth's magnetism on the suspended magnet is—$M E \cos \theta$.

The couple due to the suspension* is proportional to $I_0—I_1$, let us call it, —$G \alpha (I_1 \; I_0)$; also let $m M$ be the couple due to permanent magnetism in the induction bars.

Then for equilibrium we must have $\mu M E \sin \theta — M E \cos \theta — G \alpha (I_1 — I_0) + m M = 0$. Let the two bars be inverted, and at the same time interchanged, we thus reverse the sign of m. Hence if I_2 be the new reading

$$\mu M E \sin \theta — M E \cos \theta — G \alpha (I_2 — I_0) — m M = 0.$$

If M, E, and θ have remained unchanged, we have therefore

$M m = \frac{I_1 — I_2}{2} G \alpha = k G \alpha$ suppose.

The constant k was determined accurately by frequent reversal; then with the bars in their original position, the equation for equilibrium was

$$\mu M E \sin \theta — M E \cos \theta — G \alpha (I — k — I_0) = 0 \text{ (i).}$$

From (i) we see that if β be the dip when the scale reading was $k + I_0$, then $\mu \sin \beta — \cos \beta = 0$ or $\mu = \cot \beta$. Substituting this value of μ in (i), we get

$$M E \operatorname{cosec} \beta \sin (\theta — \beta) — (I — k — I_0) G \alpha = 0 \text{ (ii).}$$

The value of $G \div M$ was found from the formula

$$\frac{G}{M} = \left(\frac{X_1}{T_2^2} + \frac{X_2}{T_1^2}\right) \div \left(\frac{1}{T_1^2} — \frac{1}{T_2^2}\right)$$

and the value of β was determined by noting the reading I of the Inclinometer, whilst the dip of the needle was being determined in the usual way. This gave by

(ii) $\sin (\theta — \beta) = \frac{G \;\sin \beta}{M \quad E} \alpha (I — k — I_0) = C (I — k — I_0)$ nearly.

The value of the co-efficient C was calculated to be 0'·265, but this must have been too large owing to no account having been taken of the induction in the bars, due to the magnet itself. Accordingly, in reducing the observations the value 0'·25 has been adopted, which cannot be very far from the true value.

The temperature co-efficient was determined by experiments with hot water.

*The magnet, except when the reading is i_0, will also induce magnetism in the bars. The couple due to this cause will, if $I—I_0$ is small, be proportional to $I—I_0$, and might have been included with G, had the time of vibration, in the final position, been observed, which, however, was not done.

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NORTH SIDE OF ENTRANCE TO NACHVAK INLET, LABRADOR.

SHOWING THE STEEP AND UNGLACIATED CHARACTER OF THE MOUNTAINS.

Bifilar.—The scale co-efficient of this instrument was determined from the times of vibration of the magnet with bifilar suspension in three positions, viz.: In the meridian with north end north; in the meridian with north end south, and in final adjustment nearly at right angles to the meridian.

ABSOLUTE DETERMINATIONS.

The absolute determinations of the magnetic declination were made with a unifilar magnetometer by Elliott Bros., Strand, London, England. They were referred to an azimuth mark, which was a small cross cut in the rock at about sixty yards from the instrument. The magnetometer itself was on an artificial stone pillar. In making a determination the differential declinometer was read by an assistant simultaneously with the absolute instrument, and every reading of the latter was reduced to a standard reading of the former. The coincidence in the time of reading was secured by signals transmitted from the one house to the other by a string stretched between them. By this arrangement, although the changes in declination between a reading with scale direct and with scale inverted were often considerable, the results were good and the variations were little, if any, greater than were likely to occur from varying torsion, when the total directive force was so small.

Table A, p. 74, shows the result of the individual determinations of absolute declination reduced to standard reading of the declinometer and the adopted values.

The azimuth of the field mark was determined by comparison with numerous time azimuths of the sun and one time azimuth of the planet Jupiter. These azimuths were determined with the magnetometer, which is provided with an arrangement for that purpose. The various separate determinations as well as adopted azimuths are given in Table B.

The absolute horizontal force was obtained with the same magnetometer. Whilst the time of vibration was being determined, the bifilar was read at short and equal intervals, so as to ascertain the mean reading which corresponded to the mean time of vibration obtained, and the time was reduced to what it would have been at the standard reading of the bifilar; also, simultaneously, with every reading in the determination of the angle of deflection the declinometer and bifilar were read, and each reading was reduced to a standard reading of the declinometer, and the mean angle of deflection thus corrected was employed in determining the ratio of the magnetic moment of the magnet to the horizontal component of the earth's magnetism; and this ratio was reduced for the difference between the mean of the bifilar readings and the standard reading. From these, the value of the force indicated by this standard reading of the bifilar, was determined. The resulting values are shown in Table C. They indicate that the bifilar zero was satisfactorily constant, and that the observations were exceptionally well taken, considering the difficulties where the changes of declination were so rapid as was often the case.

The absolute determinations of dip were made with a Barrow dip circle, simultaneous readings of the inclinometer and bifilar being taken at equal intervals of time during the observation, and the value of the dip corresponding to a standard reading of the inclinometer deduced, the results are embodied in Table D.

Tables E, F, G, show the mean monthly and annual averages of the declination, horizontal force and dip respectively corresponding to each observation hour taken from the readings of the differential instruments.

Table H gives results of magnetic observations at sundry stations therein named.

The present report gives only the mean results, but I propose to give the results of the observations in more detail, and to further discuss them in connection with the report of the Magnetic Observatory, Toronto. It may, however, be of interest to note that during one of the magnetic disturbances the declinometer magnet oscillated through an arc of over 10°.

C. CARPMAEL.

TABLE A.

Observations of Absolute Declination for Zero of Declinometer, scale reading 350.

Date.	Declination observed.			Declinometer at observation.	Difference.			Declination at 350 West of North.			Remarks.
	°	'	"		°	'	"	°	'	"	
Sept. 27...	54	5	45	308·2	0	42	19	53	23	26	Adopted value 53° 22'·4 W.
Oct. 7...	54	42	57	270·0	1	21	00	53	21	57	
do 14...	54	42	10	270·0	1	21	00	53	21	10	
do 14...	54	39	43	272·35	1	18	37	53	21	06	Re-adjustment.
Nov. 7...	54	06	15	460	1	51	22	55	57	37	Adopted value 55° 56'·0 W.
do 8...	54	02	42	460	1	51	22	55	54	04	
do 11...	54	35	31	430	1	21	00	55	56	31	
Dec. 24...	53	55	29	370		20	15	54	15	44	Re-adjustment.
do 29...	54	23	20	360		10	07	54	13	13	Adopted value 54° 15'·5 W.
1885											
Jan. 24...	54	13	19	350		00	00	54	13	19	
do 24...	54	12	48	350		00	00	54	12	48	
do 26...	54	19	40	350		00	00	54	19	40	
do 26...	54	19	30	350		00	00	54	19	30	
do 26...	54	17	13	350		00	00	54	17	13	
do 27...	54	14	07	350		00	00	54	14	07	
do 28...	53	54	4	370		20	15	54	14	19	
do 30...	54	7	53	360		10	08	54	18	01	
Feb. 4...	54	16	36	350		00	00	54	16	36	
do 5...	54	14	33	350		00	00	54	14	33	
do 5...	53	57	39	370		20	15	54	17	54	
do 16...	53	34	40	390		40	30	54	15	10	
do 17...	54	22	09	340		10	08	54	12	01	
do 20...	54	24	12	340		10	08	54	14	04	
do 26...	54	15	36	350		00	00	54	15	36	
Mar. 5...	54	07	25	360		10	08	54	17	33	
do 7...	53	55	31	370		20	15	54	15	46	
do 14...	53	54	53	370		20	15	54	15	08	
do 23...	53	45	17	380		30	22	54	15	39	
do 28...	54	15	10	350		10	07	54	15	10	
April 4...	53	46	36	380		30	22	54	16	58	
do 14...	54	16	11	350		00	00	54	16	11	
do 21...	53	57	53	370		20	15	54	18	08	
do 21...	53	55	46	370		20	15	54	16	01	
do 23...	54	16	24	350		00	00	54	16	24	
do 23...	53	53	22	370		20	15	54	13	37	
do 29...	54	19	29	350		00	00	54	19	29	
do 29...	54	38	01	330		20	15	54	17	46	
May 12...	54	08	44	360		10	07	54	18	51	
do 14...	54	16	54	350		00	00	54	16	54	
do 15...	54	16	12	350		00	00	54	16	12	
do 16...	53	24	13	400		50	37	54	14	50	
do 18...	54	16	02	350		00	00	54	16	02	
do 18...	54	25	19	340		10	07	54	15	12	
do 22...	54	15	21	350		00	00	54	15	21	
do 29...	53	42	30	380		30	22	54	12	52	
do 29...	52	52	23	430		80	60	54	13	23	
June 3...	53	14	09	410		60	45	54	14	54	
do 5...	53	54	33	370		20	15	54	14	48	
do 12...	54	14	13	350		00	00	54	14	13	
do 16...	54	15	35	350		00	00	54	15	35	
do 17...	53	55	38	370		20	15	54	15	53	
do 23...	54	15	22	350		00	00	54	15	22	
do 23...	54	15	31	350		00	00	54	15	31	
do 30...	54	15	23	350		00	00	54	15	23	
do 30...	54	14	02	350		00	00	54	14	02	
July 8...	54	04	08	360		10	08	54	14	16	
do 16...	54	04	31	360		10	08	54	14	39	
do 20...	53	33	52	390		40	30	54	14	22	
Aug. 5...	53	23	56	400		50	37	54	14	33	
do 19...	53	45	8	380		30	22	54	15	30	

TABLE B.

Observations for Azimuth of Fixed Mark.

Date.	North Reading.			Reading of Fixed Mark.			Azimuth of Mark.			Remarks.
	°	′	″	°	′	″	°	′	″	
Sept. 27	345	18	15	162	28	30	S. 2	49	45 E.	Sun.
do 29	345	15	43	162	28	30	S. 2	47	18 E.	do
Oct. 7	345	19	13	162	28	22	S. 2	50	15 E.	do
do 9	345	20	10	162	28	40	S. 2	52	0 E.	do
do 10	345	18	39	162	28	30	S. 2	49	·59E.	do
Dec. 10	345	18	50	162	28	10	S. 2	50	40 E.	Planet Jupiter.
July 20	345	49	7	162	58	0	S. 2	51	7 E.	Sun.
do 22	345	48	40	162	58	0	S. 2	50	40 E.	do

Azimuth adopted, S. 2° 50′ 40″ E.

TABLE C.

Absolute Determinations of the Horizontal Force.

Date.	Horizontal Force at Bifalar Standard Reading.	Logarithm of Magnetic moment of Magnet.	Date.	Horizontal Force at Bifalar Standard Reading.	Logarithm of Magnetic moment of Magnet.
Oct. 18	0.6218	$\bar{3}$·9145	March 18	0·6237	$\bar{3}$·9134
Nov. 5	0·6224	·9140	do 26	0·6230	·9128
do 10	0·6219	·9136	April 24*	0·6234	·9126
do 20	0·6223	·9139	do 25	0·6239	·9127
do 28	0·6232	·9139	do 30	0·6236	·9125
Dec. 12*	0·6246	·9136	May 19	0·6236	·9125
do 13	0·6244	·9135	June 1	0·6233	·9125
Jan. 16*	0·6241	·9133	do 2	0·6233	·9125
do 21	0·6231	·9132	do 9	0·6233	·9122
Feb. 2	0·6228	·9131	do 18 & 19	0·6234	·9123
do 23*	0·6239	·9128	do 22	0·6234	·9120
do 24	0·6244	·9131	July 3	0·6237	·9123
March 10	0·6236	·9130	Aug. 14	0·6217	·9124
			do 18	0·6230	·9123

* Re-adjustment. Adopted values at standard reading.

From beginning to Dec. 3	0·62232
" Dec. 9 to Dec. 29	0·62448
" Jan. 6 to Feb. 5	0·62333
" Feb. 16 to April 4	0·62371
" April 18 onwards	0·62350

TABLE D.

INCLINATION.

Date.	Observation Dip.	Inclinometer at Observation.	Difference.	Dip at Reading 50.	Observer.	Date.	Observation Dip.	Inclinometer at Observation.	Difference.	Dip at Reading 50.	Observer.
1884.	° ′	′	′	° ′		1885.	° ′	′	′	° ′	
Dec. 17...	84 7·10	43·98	1·50	84 8·60	B	April 4...	84 1·90	99·85	12·46	83 48·44	S
do 17...	7·28	41·40	2·15	9·43	S	do 10...	8·21	82·84	8·21	84 0·00	B
do 22...	8·06	46·26	0·92	9·00	B	do 21...	83 58·24	75·53	6·38	83 51·84	S
do 22...	10·08	53·90	0·97	9·11	S	do 22...	84 3·15	85·03	8·76	54·39	B
do 29...	9·08	43·16	1·71	10·79	S	do 29...	6·88	85·46	8·86	58·02	B
do 29...	6·84	47·11	0·72	7·56	B	May 2...	4·04	92·17	10·54	53·50	S
1885.						do 2...	0·75	69·96	7·49	53·26	B
						do 8...	1·32	88·96	9·74	51·58	S
Jan. 7...	9·67	52·22	0·55	9·12	B	do 8...	2·63	77·60	6·90	55·73	B
do 7...	5·37	44·91	1·27	6·64	S	do 9...	1·01	75·30	6·33	54·68	S
do 12...	6·15	56·42	1·60	4·55	B	do 15...	2·73	92·40	10·60	52·13	S
do 12...	7·80	50·58	0·14	7·66	S	do 15...	3·66	91·30	10·32	53·34	B
do 23...	9·57	54·70	1·17	8·40	B	do 23...	2·30	81·90	7·97	54·33	S
do 24...	6·37	58·43	2·11	4·26	B	do 23...	0·49	72·50	5·62	54·87	B
do 28...	1·24	61·93	2·98	83 58·26	B	June 3...	0·43	73·60	5·90	55·53	B
do 30...	5·43	51·22	0·30	84 5·13	S	do 4...	4·97	96·10	11·52	53·45	S
do 30...	7·67	56·80	1·70	5·97	B	do 15...	4·12	88·70	9·67	54·45	B
Feb. 6...	1·21	55·92	1·48	83 59·73	S	do 15...	83 55·35	62·05	3·01	52·34	S
do 6...	5·75	51·02	0·25	84 5·50	B	do 24...	84 1·20	84·70	8·67	53·53	B
do 9...	3·88	45·02	1·24	5·12	B	do 24...	0·10	77·40	6·85	53·25	S
do 19...	2·96	80·71	7·68	83 55·28	S	July 2...	0·56	81·43	7·86	52·70	S
do 19...	2·75	78·43	7·11	55·64	B	do 2...	4·27	81·66	7·91	56·36	B
do 26...	2·48	82·76	8·19	54·29	S	do 9...	10·15	104·00	13·50	56·65	B
do 26...	4·87	79·17	7·29	57·58	B	do 9...	83 58·18	74·19	6·05	52·13	S
March 5...	5·30	79·50	7·37	57·93	B	do 14...	84 0·67	80·68	7·67	53·00	S
do 7...	4·50	91·48	10·37	54·13	S	do 20...	8·27	95·27	11·32	56·95	B
do 20...	3·56	106·41	14·10	49·46	S	Aug. 8...	4·10	87·90	9·47	54·63	B
do 20...	4·98	98·95	12·24	52·74	B	do 8...	83 58·51	79·04	7·26	51·25	S
do 28...	5·17	104·38	13·59	51·58	S						
do 28...	3·96	85·62	8·90	55·06	B						

Values adopted for scale reading 50—To Feb. 11th, 84° 6·33′ ; Feb. 11th to Aug. 20th, 83° 54·11′.

TABLE E.

Showing monthly and annual averages of Westerly Declination for each observation hour, and for the average of the six hours.

Month.	3 A.M.	7 A.M.	11 A.M.	3 P.M.	7 P.M.	11 P.M.	Means.	Remarks.
1884.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
September.........	54 11·1	54 27·0	54 22·0	53 56·5	54 35·7	54 31·6	54 20·7	18 days.
October	54 12·3	54 17·6	54 15·7	54 7·5	54 26·4	54 30·3	54 18·1	
November	54 17·0	54 26·3	54 11·3	54 11·7	54 32·2	54 40·1	54 23·1	
December	54 16·6	54 21·7	54 17·3	54 13·8	54 26·4	54 30·8	54 21·1	
1885.								
January..	54 17·9	54 22·7	54 16·3	54 12·7	54 27·3	54 38·2	54 22·7	
February.	54 10·6	54 23·4	54 12·3	54 1·0	54 33·5	54 39·8	54 20·1	
March..	54 7·4	54 13·8	54 6·6	54 3·3	54 18·6	54 21·3	54 11·8	
April.................	54 2·8	54 16·4	54 1·3	53 46·5	54 16·2	54 11·9	54 5·9	
May..	53 57·6	54 8·2	53 55·6	53 26·4	54 25·0	54 4·7	53 59·6	
June.	54 3·6	54 4·6	53 54·1	53 49·6	54 24·6	54 15·2	54 5·3	
July.	54 1·2	54 9·7	54 5·5	53 25·3	54 4·8	54 12·5	53 59·8	
August.	54 2·1	54 1·8	54 8·8	53 18·4	54 16·5	54 11·1	53 59·8	20 days.
Means..	54 8·3	54 16·1	54 8·9	53 52·7	54 23·9	54 24 0	54 12·3	

TABLE F.

Showing monthly and annual averages of Horizontal Force in Gaussian units for each observation hour and for the average of the six hours.

Month.	3 A.M.	7 A.M.	11 A.M.	3 P.M.	7 P.M.	11 P.M.	Means.	Remarks.
1884.								
September.........	....	....	....	....	....	....	....	
October	0·62255	0·61978	0·62338	0·62700	0·62524	0·62514	0·62385	8th to end of month—24 days.
November	0·62126	0·61717	0·62297	0·62583	0·62462	0·62334	0·62254	
December	0·62135	0·61895	0·62376	0·62530	0·62412	0·62486	0·62331	10th to 28th—19 days.
1885.								
January..	0·62250	0·61958	0·62384	0·62615	0·62339	0·62336	0·62314	7th to end of month—25 days.
February.	0·62201	0·61923	0·62285	0·62759	0·62277	0·62346	0·62299	17th to 28th—12 days.
March..	0·62348	0·61881	0·62255	0·62808	0·62648	0·62566	0·62417	
April.................	0·62339	0·61658	0·62316	0·62967	0·62652	0·62628	0·62427	18th to end of month—13 days.
May......	0·62429	0·61268	0·62394	0·62894	0·62859	0·62768	0·62436	
June.	0·62447	0·61350	0·62349	0·62924	0·62960	0·62719	0·62458	
July.	0·62460	0·61377	0·62294	5·63146	0·62829	0·62746	0·62475	
August.	0·62504	0·61629	0·62610	0·63178	0·62842	0·62679	0·62552	
Means..	0·62318	0.61694	0·62354	0·62828	0·62619	0·62557	0·62395	

TABLE G.

SHOWING averages of Inclination from the Inclinometer readings at each observation hour and the average of the six hours.

Months.	3 a.m.	7 a m.	11 a.m.	3. p.m.	7. p.m.	11. p.m.	Mean.	Remarks.
1884.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
December 31..	84 5·25	84 7·30	84 4·66	84 3·63	84 4·34	84 4·91	84 5·18	
1885.								
January........	9·13	10·15	8·35	7·10	8·37	8·70	8·79	
February	9·68	12·44	8·79	7 04	7·58	9·55	9·18	
March	6·50	9 07	7·13	3·79	4·47	5·17	6·03	
April..	5·45	10·29	5·32	1·57	2·76	3·08	4·74	
May.	3·81	8·65	4·21	0·68	0·39	1·84	3·26	
June	3·15	9·86	3·72	59 73	59·26	1·37	2·85	
July	3·62	9·98	4·17	59·05	0·59	1·72	3·19	
Aug., 20 days.	3·95	9 02	3·70	59·38	1·12	2 61	3·29	
Means.	84 5·725	84 9·75	84 5·55	84 2·44	84 3·21	84 4·22	84 5·17	

Inclinometer was not started until December 6.
In October, 1884, the mean inclination from six observations, with dip circle, was 84° 7·88′.
In November do do eight do do 84° 9·01′.

TABLE H.

MAGNETIC OBSERVATIONS at certain places on the Labrador and Hudson's Straits.

Date.	Place.	Lat.	Long.	Declination W.	H. F.	Dip.	Observer
		° ′	° ′	° ′	C.G.S. Unit.	° ′	
July, '84.	Nain..............................	61 40·7W.	56 32·7 N.	—	—	78 24	Stupart.
	do	....	....	—	—	78 20·2	Gordon.
Aug. 2, '84	Port Burwell..............	60 22·2 N.	64 46·4W.	49 26 W.	....	82 27·7	do
	do	....	....	49 30 W.	....	82 20·3	Stupart.
do	Ash Inlet........	62 32·7	70 35·2	....	....	84 16	Gordon.
do	Port DeBoucherville....	63 11·7	77 28 W.	52 30 W.	0·0434	86 1·7	do
Sept., '84.	Port Laperrière..........	62 34·2	78 1·4W.	....	....	85 54	do
Sept., '85	do	....	....	....	....	85 56	Bell.
Aug., '84.	Marble Island............	62 41·8	91 8·6	8 40 W.	....	84 20	Gordon.

WORK PROPOSED FOR THE EXPEDITION OF 1886.

Before entering upon the question of the work proposed for the voyage of 1886, I would point out briefly the results that seem to me to be established by the experience already gained.

1. I consider that *the temperatures* proved to exist in the straits preclude the possibility of practical navigation from November to April, inclusive.

2. It seems a reasonable certainty that in ordinary years the ice will not be sufficiently broken up to permit of the passage of vessels suitable for freight steamers before July 1st.

3. That while making the passage in July will be not attended with any serious risk to the ship, there will usually be delays more or less considerable in different years.

I would therefore propose that the "Alert" should leave Halifax about June 23rd, and endeavor to push through the straits without calling at any of the stations unless opportunity offers. To this end I arranged with the officers now in charge of the stations that they were not to expect the ship to call at their stations on the outward voyage. If successful in getting through the straits without serious delay, I would propose visiting the north-west of the Bay, partly with the view to its geological exploration, but also to examine the fishing ground of the American whalemen. I also propose to visit York Factory and examine the lead of the North River to determine the depth of water which we can carry up to Seal Island, the proposed terminus of the railway. If our supply of coal lasted, we could also visit the eastern shores of the bay. I would endeavor to make the western end of the straits, homeward bound, the first week of September, and, relieving the stations, would return to Halifax early in October.

All of which is respectfully submitted.

ANDREW R. GORDON, Lieut. R.N.,

Commanding Hudson's Bay Expedition.

TABLE I.—ABSTRACT of Meteorological Observations at Belle Isle, Labrador,

Months.	Temperature.					Amount of Sky Clouded 0-10.	Rain.		Days of Snow.	Direction		
	Mean of Tri-Daily Observation.	Mean of Max. and Min.	Highest Temperat.	Lowest Temperat.	Mean Daily Range.		Amount.	Days of		Whole No. of Observations.	N.	N.-E.
1884.												
October	35·23	35·17	46·0	22 0	6·30	6·8	12·69	9	6	90	3	6
November	24·65	25·15	40·0	9·0	7·07	6·3	0·11	5	11	90	18	7
December	10·69	11·11	40·0	—13·0	6·68	5·9	0·08	2	6	93	18	5
1885.												
January	6·39	6·65	39·0	—19·0	6·50	6·4	0·12	2	8	93	8	9
February	17·68	18·00	33·0	— 9·0	7·64	6·7	0·00	0	6	84	21	22
March	15 70	15·39	35 0	— 9·0	8 90	5·8	0·24	3	5	93	5	7
April	27·99	27·12	34·0	3·0	6·23	6·9	1·17	4	13	90	24	14
May	34·06	34·06	45·0	18·0	5·87	7·6	2·42	12	14	93	2	9
June	40·54	41·89	60 0	26·0	6 97	7·9	3·41	11	3	90	5	9
July	52·47	53·58	69·0	42·0	7·04	6·9	2 02	15	....	93	3	14
August	54·52	55·69	68·0	46·0	7·32	6·1	1·28	9	.....	93	0	8
September	47·71	46·77	59·0	30·0	5 67	7·0	7·71	14	.....	90	6	3
Year	30·64	30·88	69·0	—19·0	6·85	6·7	31·25	86	62	1092	113	113

Lat. 51° 53′, Long. 55° 22′, from October, 1884, to September, 1885, inclusive.

of Wind.							Velocity of Wind.						Fogs.	
								No. of times the Velocity was						
E.	S.-E.	S.	S.-W.	W.	N.-W.	C.	Average Velocity.	20 miles.	30 miles.	40 miles.	50 miles.	60 and upwards.	No. of Days	Average No. of days, 1872-1883.
9	4	2	17	22	27	0	20·0	9	11	9	6	5	8	11
6	5	1	15	17	21	0	24·0	31	23	5	1	4	6	11
7	2	2	10	21	26	2	21·0	32	6	4	10	5	5	7
5	1	4	14	27	25	0	24·0	14	6	12	10	10	9	8
11	7	1	1	10	10	1	14·0	30	14	2	2	0	6	8
9	13	11	14	27	6	1	14·0	27	3	8	1	1	8	9
9	9	0	9	16	8	1	12·0	12	9	5	2	0	7	10
23	16	7	12	18	4	2	10·2	19	7	2	0	0	12	13
7	15	0	11	34	6	3	11·4	14	2	2	1	3	19	15
13	6	1	8	34	12	2	6·0	7	1	0	0	0	17	15
15	6	0	20	28	16	0	6·8	10	3	0	0	0	11	15
0	4	3	36	16	21	1	14·4	20	5	6	2	1	5	14
114	88	32	167	270	182	13	14·82	225	90	55	41	29	113	136

TABLE II.—PORT BURWELL STATION, "No. 1,"

Months.	Barometer at 32° and Sea Level. Mean.	Highest Obs.	Lowest Obs.	Range.	Temperatures. Mean.	Highest Obs.	Lowest Obs.	Mean of Warmest Day.	Mean of Coldest Day.	Mean. Max.	Mean. Min.	Range.
1884.												
August	29·743	30·078	29·049	1·029	37·69	47·9	31·9	44·0	34·2	42·4	33·8	8·6
September	29·702	30·194	29·180	1·014	32·85	41·0	27·3	38·8	28·9	35·3	29·5	5·8
October	·719	·272	28·941	1·331	25·70	36·3	12·0	34·7	15·3	28·5	22·0	6·5
November	·726	·426	29·018	1·408	10·14	31·9	— 9·3	24·3	— 4·5	14·6	4·8	9·8
December	·833	·272	28·922	1·350	— 7·80	18·8	—29·8	12·0	—25·1	— 2·8	—13·9	11·1
1885.												
January	·631	·389	29·096	1·293	—17·70	5·7	—33·2	0·1	—29·4	—12·5	—23·2	10·7
February	30·061	·632	·385	1·247	2·30	29·9	—19·9	27·1	—16·0	7·8	— 5·2	13·0
March	29·771	·355	28·860	1·495	— 7·25	18·8	—21·9	12·1	—16·0	— 1·8	—14·6	12·8
April............	·907	·246	29·261	·985	16·24	34·6	— 9·0	33·9	— 5·2	21·0	9·4	11·6
May...............	·912	·552	·268	1·284	28·05	40·1	14·4	36·1	19·3	31·8	23·3	8·5
June	·743	·212	·191	1·018	33·42	46·5	25·1	40·7	30·2	36·5	29·1	7·4
July	·762	·265	·084	1·181	41·85	63·1	33·9	47·3	35·2	49·0	35·6	13·4
August..........	·780	·327	·320	1·007	41·69	62·0	31·9	53·7	33·9	47·4	36·9	10·5
Year.......	29·795	30·632	28·860	1·772	16·62	63·1	—33·2	53·7	—29·4	22·23	11·14	10·09
September	29·729	30·037	29·018	·956	35·41	42·8	28·9	40·4	30·4	37·9	32·1	5·8

10th August, 1884, to 27th September, 1885, inclusive.

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind. Mean Hourly Velocity.	Wind. Highest Daily Mean.	Wind. Highest Velocity	Cloudiness to Tenths.	Rain. Duration in Hours.	Rain. Depth in Inches.	Snow. Duration in Hours.	Snow. Depth in Inches.	Number of Days Auroras Reported.
·202	90·0	34·9	15·6	33·1	42·5	7·8	56·30	1·21	25·30	0·45	3
·185	98·3	32·4	15·4	30·8	46·0	8·5	79·00	0·97	64·40	2·68	3
·167	99·7	29·9	16·9	33·0	42·0	8·1	....	....	67·35	44·8	11
....	....	....	16·5	51·7	84·0	8·4	....	....	234·00	66·50	5
....	....	....	16·8	35·0	41·0	5·5	....	....	131·00	49·00	22
....	....	....	14·8	31·5	50·0	4·7	....	....	73·25	34·90	14
....	....	....	14·2	56·0	70·0	6·3	....	....	146·00	35·71	9
....	....	....	16·4	29·5	48·0	5·2	....	....	116·30	26·60	7
....	....	....	16·2	39·5	54·0	8·3	....	....	119·50	24·66	1
·147	93·9	26·5	15·8	34·8	44·0	8·3	38·10	0·09	177·55	16·30	1
·174	90·9	31·0	11·7	21·3	30·0	7·8	73·10	0·84	53·35	1·53	....
·225	84·9	37·4	6·6	17·2	36·0	6·5	61·25	2·03	....	....	....
·230	87·1	37·8	8·9	21·2	36·0	7·0	74·30	1·14	....	....	6
·188	92·5	32·5	14·2	33·8	48·4	7·05	326·15	5·07	1,184·30	302·68	79
·189	90·0	32·9	16·2	44·0	34·8	7·7	59·40	0·18	41·40	5·17	8

TABLE III.—SKYNNER'S COVE—6th October, 1884,

Months.	Barometer at 32° and Sea Level.				Temperature.							
	Mean.	Highest Obs.	Lowest Obs.	Range.	Mean.	Highest Obs.	Lowest Obs.	Mean of Warmest Day.	Mean of Coldest Day.	Mean Maximum.	Mean Minimum.	Range.
1884.												
October	29·616	30·248	28·956	1·292	25·73	37·0	11·0	35·2	16·0	29·60	25·65	3·92
November	·725	·409	·749	1·660	13·08	31·5	— 0·5	26·6	4·8	17·23	7·92	9·31
December......	·813	·486	·722	1·764	— 3·20	15·2	—21·8	11·8	—16·8	2·40	— 7·20	9·60
1885.												
January	·569	·393	·925	1·468	— 10·57	9·9	—27·8	5·4	—23·3	—3·39	— 17·15	13·76
February......	30·048	·632	29·363	1·269	0·92	30·8	—25·3	27·8	—21·3	10·50	— 6·80	17·30
March	29·739	·363	28·655	1·708	— 2·78	18·0	—18·3	9·7	—12·1	6·76	— 9·60	16·36
April..........	·849	·320	29·214	1·106	19·17	39·0	— 4·7	34·4	— 1·0	28·00	12·60	15·40
May	·913	·520	·287	1·233	31·10	44·5	17·5	38·0	23·1	37·40	26·40	11·00
June	·740	·207	·142	1·065	38·70	67·0	25·5	55·6	29·1	44·90	32·50	12·40
July	·759	·252	·087	1·165	46·20	77·0	34·0	59·0	39·0	54·10	38·70	15·40
August..........	·785	·350	·286	1·064	46·02	71·5	35·0	60·8	39·5	53·20	39·20	14·00
September......	·724	·075	·033	1·042	37·80	60·5	29·0	45·2	34·1	42·60	33·40	9·20
	29·773	30·632	28·655	1·977	20·19	77·0	—27·8	60·8	23·3	26·90	14·60	12·3

NOTE —Mean Temperature for October being for last 26 days of the month a correction of approximate 0·7° should be added to the Mean for that month—given above.

to 3!st D·cember, 1885, Station " No. 2."

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind.			Mean Cloudiness to tenths.	Rain.		Snow.		No. of Auroras.
			Highest Velocity	Highest Daily Mean.	Mean Hourly Velocity.		Duration in Hours.	Depth in Inches.	Duration in Hours	Depth in Inches.	
·109	75·8	19·2	50·	30 0	7·60	5·09	19·30	0 02	73·35	17·04	26
·063	77·4	7·3	40·	29·1	9·36	5 03	....	....	64·00	11·10	14
·032	78·4	— 7·6	45·	29·5	7·76	3 83	....	....	88·30	6·40	9
....	....	....	60·	26 6	8·04	3 76	....	....	157 00	15·10	10
....	....	....	40·	26·7	5·65	5·10	....	....	201·00	12·70	9
·035	85 0	— 5·8	40·	35·0	10·20	4·70	....	......	158·00	10 60	15
·096	84.4	15·4	30·	18·8	7·18	6·30	....	....	146·30	27·20	6
·144	81·0	25·7	45·	22·5	9·23	6·79	108·0	0·23	100·00	9 70	....
·170	73·8	30·1	50·	25·8	9·22	6·89	70·30	1·14	43·00	19·20	....
·240	77·9	38 9	40·	19·2	6·95	6·12	99 00	1·93	....	....	2
·237	76·8	38·4	40·	19·7	6·80	6·63	155·30	4·26	....	....	16
·180	78·0	31·2	50·	26·6	8·83	7·07	135·30	2·80	43·00	6·10	11
·117	80·4	16·0	44·16	25·8	8·07	5 61	578·00	10·38	1074·35	135·14	112

Table IV.—Ashe Inlet Station No. 3.—

Months.	Barometer at 32° and Sea level.				Tempera				
	Mean.	Highest Obs.	Lowest Obs.	Range.	Mean.	Highest Obs.	Lowest Obs.	Highest Daily Mean.	Lowest Daily Mean.
1884.									
August, 13 days..........	29·741	30·055	29·137	·918	36·36	47·0	32·0	41·3	33·0
September..................	29·751	30·238	·214	1·024	31·35	46·5	19·0	41·3	24·6
October......................	·695	·310	28·891	1·419	20·25	34·2	2·4	33·2	5·6
November....................	·575	·399	·710	1·689	9 06	31·0	—13·5	30·0	—10·4
December....................	·812	·499	29·199	1·300	-11·05	8·2	—28·2	4·4	—25·0
1885.									
anuary.........................	·604	·202	28·977	1·225	-19·22	—4·2	—30·1	—5·9	—29 0
February.......................	30·054	·604	29·302	1·302	1·60	29·0	—14·2	28·4	—11·5
March............................	29·747	·306	·144	1·162	-12·59	—0·3	—24·6	1·8	18·8
April.............................	·919	·366	·349	1·017	10·36	35·4	—20·6	32·8	11·2
May...............................	·922	·600	·277	1·323	26·66	40·9	4·8	36·9	19·7
June...............................	·750	·173	·156	1·017	33·80	46·0	26·8	38·8	31 0
July...............................	·734	·159	·129	1·030	40·25	54·3	31·4	45·9	36·4
August..........................	·734	·294	·171	1·123	39·22	48·4	32·7	45·3	34·7
Year..............................	29·775	30·604	28·126	2·478	14·14	54 3	—30·1	45 9	—29·0
September, 18 days	29 890	30 045	29·702	·343	35·87	43 9	26 9	41·1	31·0

18th August, 1884, to 18th September, 1885.

ture.			Wind.			Relative Humidity.	Cloudiness to Tenths.	Rain.		Snow.		Days Auroras Reported.
Mean. Max.	Mean. Min.	Range.	Mean Velocity.	Highest Daily Mean.	Highest Obs.			Duration in Hrs.	Depth in Inches.	Duration in Hrs.	Depth in Inches.	
39·97	32·07	7·90	13·1	24·0	37·5	91·4	7·1	....	·75	2·7	·29	3
34·49	26·47	8·02	12·4	24·8	34·0	80·2	6·7	....	·97	....	6·85	11
23·73	15·41	8·32	15·5	32·7	45·0	76·8	7·2	....	·18	....	8·60	8
13·83	4·63	9·20	17·3	49·2	68·0	78·9	8·0	....	....	....	11·20	5
—7·10	—14·51	7·41	11·1	31·3	40·0	85·2	4·5	....	....	....	·90	12
—16·00	—22·52	6·52	12·5	3 60	48·0	....	3.3	....	....	....	1·80	15
7·44	—3·97	11·41	12·2	43·2	48·0	....	6·8	....	....	....	16·80	8
—7·99	—17·25	9·26	13·5	31·7	46·0	92·4	4·3	....	....	....	3·80	7
16·44	4·27	12·17	15·7	38·3	44·0	93·2	7·3	....	....	....	24·32	2
30·59	22·33	8·26	15·9	36·7	60·0	90·8	8·1	....	·02	....	23·95	....
37·47	30·17	7·30	13·7	26·0	48·0	87·1	7·3	....	·02	....	9·00	....
45·89	36·01	9·88	12·8	34·0	40·0	86·3	7·0	....	2·86	....	....	....
44·76	35·08	9·68	15·1	36·3	42·0	83·0	3·6	....	3·16	....	·02	....
18·63	9·68	8·95	14·0	35·0	47·0	85·4	7·2	....	7·21	....	107·24	68
39·4	32·4	7·0	10·2	22·3	38·0	79·7	6·4	....	·01	....	·21	4

TABLE V.—STUPART'S BAY, Station No. 4.—

Months.	Barometer at 32° (sea level). Mean.	Highest Obs.	Lowest Obs.	Range.	Temper Mean.	Highest Obs.	Lowest Obs.	Mean of Warmest Day.	Mean of Coldest Day.
1884.									
September	29·728	30·215	29·150	1·065	32·1	42·1	21·1	37·3	27·8
October	29·684	30·309	28·805	1·504	19·9	35·9	— 1·9	33·2	2·5
November	29·678	30·414	28·592	1·822	5·1	29·9	—13·4	23·6	— 8·0
December	29·822	30·445	29·178	1·267	—12·4	7·8	—32·2	6·6	—29·5
1885.									
January	29·624	30·192	29·138	1·054	—22·6	— 5·0	—34·6	— 7·9	—32·0
February	30·023	30·581	29·176	1·405	— 3·9	29·2	—26·6	26·8	—20·7
March	29·752	30·266	29·126	1·140	—15·5	— 1·1	—31·5	— 7·6	—23·0
April	29·892	30·354	29·305	1·049	9·1	32·2	—18·4	29·3	—10·0
May	29·895	30·531	29·310	1·221	25·2	39·7	— 2·8	34·5	16·7
June	29·731	30·119	29·165	0·954	33·9	49·8	24·6	43·6	30·2
July	29·692	30·146	29·087	1·059	42·6	64·6	32·9	55·0	36·4
August (20 days)	29·633	30·224	29·145	1·079	42·7	62·4	32·9	53·4	38·1
Year	29·7628	30·581	28·592	1·989	13·02	64·6	—34·6	55·0	—32.0

1st September, 1884, to 20th August, 1885.

ature.				Wind.				Rain.		Snow.		
Mean Maximum.	Mean Minimum.	Range.	Relative Humidity.	Mean Hourly Velocity.	Highest Daily Mean.	Highest Velocity.	Cloudiness to tenths.	Duration in hours.	Depth in inches.	Duration in hours.	Depth in inches.	Auroras, No. of days.
35·3	28·5	6·8	....	9·5	21·2	30	8·4	70	1·44	26	3·1	9
24·4	14 8	9·6	....	11·7	22·8	36	7 8	....	....	100	41·8	16
11·0	— 1·1	12·1	....	11·5	40·0	49	7·7	....	....	163	46·3	12
— 7·8	—17·1	9·3	....	7 1	19·9	40	6·3	....	....	42	6·3	17
—18·6	—27·3	8 7	....	8·2	38 9	52	4·7	....	....	18	2·1	22
3·3	—10·4	13·7	....	8·9	34·2	45	7·1	....	....	65	31·7	14
— 9·9	—22·6	12·7	....	12·2	43·0	61	5·2	....	....	3	0·2	11
16·0	0 0	16 0	....	11·7	29·2	48	7·0	....	....	63	15·9	4
30·1	18·2	11·9	89 5	10·9	21 9	34	8·3	2	0·01	57	16 9	3
38·1	29·1	9·0	86·4	9·2	22·8	40	8·0	3	0·27	87	4·7	....
50·0	36·1	13·9	84·1	5·9	23·5	44	7 2	98	4·42	....	....	....
49·4	37·3	12·1	85·6	8·1	13·0	24	7·6	53	3·00	....	....	....
18·4	7·1	11·3	....	9·6	43·0	61	7·1	226	9·14	624	169·05	108

TABLE VI.—PORT DEBOUCHERVILLE, Station No. 5.—

Months.	Temperature.							
	Means.	Lowest Obs.	Highest Obs.	Mean of Warmest Day.	Mean of Coldest Day.	Mean Maximum.	Mean Minimum.	Range.
1884.								
September	31·20	24 8	39 0	35 8	26·0	33·26	29·19	4·07
October	16·00	— 9·8	31·2	32·0	— 2·7	18·96	12 60	6·36
November	5·21	—14 8	29·2	24 9	— 7·2	10 05	— 1·08	11·13
December	—15·52	—32·5	13 8	7·3	—28·1	—11·90	—19·50	7·60
1885.								
January	—26·29	—35 0	—10·8	—13·7	—33 5	—22·59	—29·34	6·75
February	— 5·43	—29·9	29·6	28·4	—24·5	·10	—11·30	11·40
March	—18 69	—30·1	— 7·5	—10·1	—24·5	—13·80	—23 80	10·00
April	6·74	—23·1	30·0	20·7	—14·3	11·21	1·26	9·95
May	24·67	10 0	37·6	34·7	17·4	37 85	20·34	7 51
June	33·13	25·2	40·3	36·6	28·5	36·12	30·05	6·07
July	39·13	33·1	56·9	47·4	35·4	43·42	35·13	8·29
August 23	37·67	33·1	45·0	42·3	30·7	40·30	35·55	4·75
Year	10·65	—35·0	56·9	47·4	—33 5	14·41	6 59	7·82

1st September, 1884, to 23rd August, 1885.

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind. Mean Velocity.	Wind. Highest Daily Mean.	Wind. Highest Obs.	Cloudiness to tenths.	No. of days Auroras reported.	Rain. Duration in hours.	Rain. Depth in inches.	Snow. Duration in hours.	Snow. Depth in inches.
·148	83·3	27 6	8·9	27·3	41.	9·3	2	....	....	9·00	·1
·088	85·1	12·8	10·3	22 0	34·	7·4	3	5	·31	111·50	23·2
·052	84·6	2·6	10·8	34 0	40·	3 2	3	....	....	54 30	10·7
·021	91·3	—16·8	5 7	22·5	31·	4·7	11	....	....	42·30	1·3
·009	72·5	—26 9	5·6	27·8	32·	3·8	11	....	....	1·55	1·7
·037	90 4	7·1	9·2	31·5	40·	6 1	7	....	....	62·30	9·2
·016	91·4	20·2	6·5	25 8	27·	4·5	7	....	....	....	....
·060	91·6	4·7	8·2	18 6	28·	6·9	3	....	....	92·30	9·2
·111	86·1	21·1	10·6	22 5	32·	7 7	2	....	....	5 20	·7
·137	72·3	28 3	10·9	26·5	34·	7·0	....	....	....	6·15	·2
·201	84·6	34·5	11·1	23 6	34·	6·9	....	35·	1·08	....	....
·199	88 6	34·5	13·8	19 8	28·	7·9	....	51·	2·36	....	....
·0896	85 15	12·4	9·3	23·5	33·4	6 29	49	91·	3·75	386·20	56·3

TABLE VII.—LAPERRIÈRE'S HARBOR—1st October, 1884,

Months.	Barometer at 32° and Sea Level.				Temperature.							
	Mean.	Highest Obs.	Lowest Obs.	Range.	Mean.	Highest Obs.	Lowest Obs.	Mean of Warmest Day.	Mean of Coldest Day.	Mean Maximum	Mean Minimum.	Range.
1884.												
October..........	29·690	30·395	29·019	1·376	19·60	38·0	1·7	35·7	4·2	22·7	15·8	6·9
November......	·670	·375	28 656	1·719	5·40	30·0	—13·6	18·8	—6·4	11·3	—·3	11·6
December.......	·835	·366	29·122	1·244	—13·56	9 6	—34·5	5·5	—29·5	—10 0	—18·4	8·4
1885.												
January	·654	·270	·223	1 047	—27·40	—8·0	—36·7	—12·0	—36·0	—23 6	—31·8	8 2
February	30·000	·529	·029	1·500	—6·01	29 0	—31·2	20 0	—24·7	— 0·6	—13 9	14·5
March...........	29·779	·248	·146	1·102	—19·17	—8·4	—32·0	—11·3	—27·8	—14·3	—23·9	9·6
April............	·894	·355	·019	1·336	6·12	25 6	—18·0	21·7	—15·2	12·0	— 0·4	12·4
May.............	·913	·486	·358	1·128	23·80	35·6	9·2	33·3	14·9	29·2	18·4	10·8
June.............	·747	·067	·290	·777	35·23	42·5	22·6	36·5	27·1	38·1	29·2	8·9
July..............	·627	·026	·186	·840	40·20	62·2	30·9	53·3	34·5	48·2	34·7	13·5
August..........	·596	29·911	·116	·795	39·63	60·8	32·1	51·3	34·5	46 5	35·2	11·3
11 mos. nearly	29·766	30·529	28·656	1·873	9·44	60·8	—36·7	53·3	—36·0	14·60	4·05	10·55

to 24th August, 1885, Station No. 6.

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind. Mean Velocity.	Wind. Highest Daily Mean Velocity.	Wind. Highest Obs.	Cloudiness to Tenths.	Rain. Duration in Hours.	Rain. Depth in Inches.	Snow. Duration in Hours.	Snow. Depth in Inches	No. of Days Auroras.
·104	90 0	....	16·2	38·5	48·0	8·3	8 30	·5	44·	10·5	2
·056	91·5	....	16 5	40 9	60·0	7·7	....	....	44·45	13·5	7
·032	90·5	....	11·2	23·8	60·6	5·0	....	....	10·30	3·5	15
·010	85·5	....	12·6	29·9	39 0	4 6	....	....	9·30	·1	18
·036	86 0	....	14·1	32·2	52·2	6 4	....	....	....	....	9
·015	82·0	....	11 8	27·3	36 6	5·1	....	....	....	....	13
·061	82·0	....	14 9	34 5	41·4	7 9	....	....	11·00	3 5	4
·124	73·0	....	14·2	27·0	36·6	8·8	....	....	74·40	0 1	0
·168	79 0	....	11·3	21·5	32·4	8·8	12·	2 8	36 45	2·25	0
·218	79 0	....	11·1	22·8	37·8	7·4	36·	1·58	....	....	0
·224	89 0	....	16·1	32·8	39 6	8·5	60·15	2·09	....	....	0
·095	84·3	....	13·5	30·1	44 0	7·1	116·45	6·97	231·10	33·45	68

TABLE VIII.—ABSTRACT of Meteorological Observations at Fort Churchill, August, 1885,

Month.	Barometer at 32°.				Temperature.				
	Average.	Highest.	Lowest.	Range.	Average.	Highest.	Lowest.	Average of Warmest Day.	Average of Coldest Day.
1884.	Inches.	Inches.	Inches.	Inches.	°	°	°	°	°
October	29·931	30 528	29·005	1·523	24·44	60·0	4·0	53 00	7·67
November	29·890	30·500	29·030	1·470	4·96	34·0	—25·0	31·67	—21·33
December................	29·991	30 509	28·800	1·709	—16·45	29 0	—37·0	23 33	—35 ·67
1885.									
January	29·799	30·358	29·191	1·167	—24·79	— 4·0	—40·0	—6 67	—36·00
February..................	29 961	30·441	29 211	1·230	—16·51	12·0	—40·0	6·33	—34·00
March......................	30·055	30·500	29 386	1·114	—14·30	16·0	—35 0	—4·00	—28·33
April	29·958	30·390	28 998	1·392	9·02	34·0	—16·0	26 67	— 8·33
May.........................	29·964	30·403	29·407	0 996	22·48	44·0	— 8 0	39·33	2·67
June	29·898	30·228	29·512	0·716	40·47	75·0	28·0	69·00	30·67
July	29 611	29·932	29·201	0·731	55·99	84·0	35·0	76·33	37·33
August.....................	29·721	30 225	29·306	0 919	47·20	68·0	37·0	60 33	39 ·67
Sept. (estimated)	....	....	....	....	36·70	....	....	....	....

Mean temperature for year, 14·1°.

H.B., Latitude 58° 43′ N., Longitude 94° 10′ W., from October, 1884 to inclusive.

Wind.					Rain.						
Prevailing Direction.	Total Mileage in Month.	Average Hourly Velocity.	Average of Most Windy Day.	Average of Least Windy Day.	Amount.	Days.	Days of Snow.	No. of Fogs.	No. of Auroras.	No. of Thunder Storms.	Average Cloudiness.
		Miles.	Miles.	Miles.							
N.W......... ...	10,313	13·86	31·04	2·17	2·000	2	8	1	4	....	6·5
N.W., S.W...	10,112	15·05	36·87	2·42	....	....	13	0	3	....	6·4
N. W.....	6,301	8·47	16·71	0·25	....	....	5	0	9	....	4·2
N.W...........	10,084	13 55	30 42	0·42	....	....	11	0	10	....	3·9
N.W., S.E....	6,551	9 75	32 67	0·29	....	....	10	0	8	....	4·8
N.W......... ...	8,166	10·98	31·38	0·67	....	....	14	0	10	....	2·9
N.E.......... ...	4,535	6·75	28·45	0·33	R	1	7	0	6	....	4·3
N.W., N.E...	7,159	9·94	33·17	0·62	....	....	9	1	2	1	6·5
N.W., N.E...	5,044	7·01	14·08	1·71	0·74	6	6	2	0	0	6·7
N.W., S........	6,160	8·28	20·42	1·46	3·07	14	9	4	0	2	7·4
N. W............	5,534	8·54	17·00	1·54	1·89	15	0	4	5	1	7·2
....	....	....	....	....	....	....	....	....	....	....	....

TABLE IX.—ABSTRACT of Meteorological Observations at York Factory, H.B., of Years,

Months.	Barometer	Temperature.					
	Monthly Average.	Monthly Average.	Average of Highest Temperatures.	Average of Lowest Temperatures.	Range.	Highest in Series.	Lowest in Series.
	inches.	°	°	°	°	°	°
October	29·910	27·60	45·1	5·1	40·0	56 0	— 2 0
November	29·944	7 46	34·3	—24·8	59 1	38·0	—40·0
December	29 945	—13·23	18·2	—34 9	53·1	29 0	—50·5
January	30·008	—20 74	7·3	—45·3	52·6	26·5	—51·0
February	29·926	—14·26	19·2	—42 0	61·2	44 0	—53·0
March	30·164	— 6·48	31·9	—33·1	65 0	40·0	—48·0
April	30·036	+19·36	47·5	—16·1	63·6	54·0	—22·5
May	29·962	35·86	73·5	2·9	70 6	82·0	—15·5
June	29·942	53·64	93 0	27·9	65·1	101·0	32 0
July	29·876	63·30	98·5	40·9	57·6	106 0	37·0
August	29·867	53·91	85·1	35·4	49·7	98·0	29·0
September	29·910	42·33	68·4	30·4	38·0	83·0	24 0
Year	29·957	20 73	98·5	—45·3	143 8	106·0	—53·0

Lat. 57° 0′, Lon. 92° 28′, Height above Sea Level 55 feet, Derived from a group 1876 to 1883.

Wind.			Mean Relative Humidity.	Amount of Cloudiness.	Rain.		Snow.		No. of Fogs.	No. of Aurorass.
Prevailing direction from—	Average Total Mileage in Month.	Average Hourly Velocity.			Amount.	Days of.	Amount.	Days of.		
				0—10	inches.		inches.			
N.W. & N.E.	9 217	12·38	94	5 7	1·22	2	9·1	12	3	8
N.W., S.W..	9·420	13·08	92	5·4	0·03	1	15·1	14	2	9
N.W..........	8·497	11·54	85	5·5	0·00	0	11·3	15	2	10
N. & N.W...	8·953	12·04	91	3·7	0·00	0	7·1	12	3	12
N.E. & S.E...	8·797	13 04	85	4·3	0·00	0	4·5	10	3	11
N.E......	9·603	12 92	80	4·1	0·00	0	7·3	13	3	12
N.E......	8·410	11·67	88	4·8	0·12	1	4·8	6	3	9
N.N.E.........	9·397	12·62	90	5·0	2·34	4	9·2	6	4	6
N.N.W.........	8 617	11 96	83	4·2	3·40	8	0·8	2	5	3
N., S.W......	8·775	11 92	77	4·4	7·69	10	....	....	3	3
N.E., N.W...	9·565	12·87	87	4·7	6·47	10	....	....	4	6
N.W., N.E...	8·603	11 96	84	4 6	3·83	8	0·9	5	2	8
N.W., N.E...	....	12·33	86	4·7	25·10	44	70·1	95	37	97

TABLE X.—Table showing number of hours of Snow observed at Hudson Straits Stations and at Belle Isle Island Lighthouse.

Months.	Skynner's Cove, Nachvak.	Port Burwell.	Ashe Inlet.	Stupart's Bay.	Port DeBoucherville, Nottingham Island.	Port Laperrière.	Belle Isle.
1884.							
August	—	25	—	—	—	—	0
September	—	64	104	26	9	—	24
October	73	67	160	100	111	44	78
November	64	234	252	163	54	44	82
December	88	131	60	42	42	10	44
1885.							
January	157	73	36	18	1	0	76
February	201	146	200	65	62	9	52
March	158	116	92	3	0	0	30
April	146	119	236	63	92	11	119
May	100	177	172	57	5	27	19
June	43	53	100	87	6	36	53
July	0	0	0	0	0	0	0
August	0	0	4	0	0	0	0
September	43	41	—	—	—	—	0

The —— when entered in the tables signifies that there were no observations at the stations during the month, or that the observations were for a broken period.

TABLE XI.—Fog Comparison.

Months.	Nachvak, Skynner's Cove.	Chudleigh, Port Burwell.	Ashe Inlet.	Stupart's Bay.	Nottingham Island, Port DeBoucherville	Digges Island, Port Laperrière.	Churchill.	Belle Isle.
1884.	hours.	hours.	hours.	hours.	hours.	hours.	hours.	hours.
August	—	76	½ month 16	—	—	—	—	184
September	—	48	....	48	28	—	—	76
October	....	....	....	....	12	24	8	60
November	....	....	....	....	....	....	....	56
December	....	....	....	....	....	....	....	64
1885.								
January	....	....	....	....	....	....	....	96
February	20	4	4	24	8	4	....	72
March	....	....	8	....	8	....	....	32
April	12	....	....	....	....	....	....	72
May	....	....	20	32	....	24	8	152
June	36	32	8	152	12	124	16	248
July	92	100	40	220	132	224	32	288
August	100	148	120	20 days 33	152	116	32	171
September	136	88	18 days. 32	—	—	—	—	40

The above table gives the actual number of hours of Fog observed at the Hudson's Bay and Straits Stations, and at Belle Isle Lighthouse. The entries for Ashe Inlet, in August, 1884, cover only the last half of the month; those for Stupart's Bay, in August, 1885, only include the period from the 1st to 20th of the month; and those for Ashe Inlet, September, 1885, only include from the 1st to the 18th of the month.

TABLE XII.—Showing the number of days in each month on which the wind reached the force of a gale at Belle Isle and at the Stations in Hudson's Straits, 1884 85.

Month.	Belle Isle.	No. 1. Port Burwell.	No. 2. Skynner's Cove.	No. 3. Ash Inlet.	No. 4. Stupart's Bay.	No. 5. Port DeBoucherville.	No. 6. Port Laperrière.
1884.							
August	5	1	—	—	—	—	—
September	10	1	—	0	0	0	—
October	10	1	2	3	0	0	4
November	7	1	2	3	4	2	2
December	8	0	3	1	2	0	1
1885.							
January	15	4	2	3	4	4	0
February	1	4	3	4	4	2	2
March	7	2	6	2	2	0	0
April	5	4	0	2	2	0	3
May	2	1	2	2	0	3	0
June	3	0	4	1	1	0	0
July	0	0	1	1	1	0	0
August	1	0	1	2	0	0	2
Sum for year, September to August.	69	18	26 11 mos.	24	20	11	14 11 mos.

NOTE.—The dash entered in the columns signifies that no observations were taken or that the period was incomplete.

TABLE XIII.—PORT BURWELL, Station "No. 1,'

Months.	No. of Observations.	No. of Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
1884.																
September	180	9	2	6 50	6	8·84	31	13·81	7	23·15	25	19·24	1	7·00	11	25 09
October..............	186	8	5	12 80	1	5 00	4	11·50	7	7 72	22	13·91	—	—	7	7 85
November	180	19	8	13·64	2	3·00	3	14·00	3	24·33	9	47·67	3	4·66	5	6·40
December...........	186	19	4	19 00	1	18·00	16	15·00	7	15·86	7	16 6	—	—	—	—
1885.																
January	186	38	5	30·40	1	16 00	7	26·86	5	16·40	—	—	—	—	—	—
February	168	41	1	18 00	5	10·20	29	21·00	8	24 75	22	33·63	3	5 66	5	12·20
March	186	23	4	31·25	1	3·00	11	21·81	1	23 00	14	12·37	2	17·00	3	5·66
April..................	180	8	11	9·45	3	4·33	13	20·31	18	23·28	26	25·08	9	13 78	5	7·80
May	186	11	3	10 33	—	—	11	11·27	30	18·03	26	19 81	2	5·50	2	7·50
June	180	16	6	9 67	—	—	12	12·17	23	18·04	23	12·30	—	....	13	6 76
July	186	61	2	9·00	1	10·00	2	10 00	4	22·25	24	16·58	3	11·00	21	7·95
August	186	29	4	11·75	2	13 00	8	12·00	5	16·80	31	14·42	6	13·17	14	6·43
Year	2190	282	55	14·82	23	8·70	147	16·62	118	19 08	229	20·29	29	10·66	86	9·84

Year, 1st September, 1884, to 31st August, 1885.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
1	35·00	2	8·00	4	9·25	11	12·18	5	14·20	18	18·88	8	16·75	25	18·73	14	10·21
4	7·75	5	20·00	12	13 60	35	19·03	8	20·63	17	19·00	16	24 44	31	22·32	6	17·33
5	7·80	8	18 00	10	17 00	48	24 06	3	16·00	14	16·07	3	15 00	23	15 52	12	16·58
1	19 00	12	14 08	18	15·06	68	21·75	7	21 00	15	18·47	5	13·00	4	15·75	2	28 50
1	9·00	18	9·94	23	13·42	63	23·08	1	31·00	7	17·28	12	10·40	4	15·25	1	28·00
4	4·75	22	11 00	9	15·00	12	14·75	2	20·00	3	16·33	1	6 00	—	—	1	12·00
2	7·00	13	11·31	21	17 38	56	21·94	9	24·22	11	18·55	2	8·00	4	24·50	9	15·22
1	3·00	6	8·83	10	15·20	31	17·61	15	16 26	3	11·00	8	15 88	8	11·62	5	9·40
3	13·66	3	8·33	5	21·20	33	18·12	14	24·43	15	15·60	12	14·92	8	12·25	8	8·75
2	4·00	3	10·00	2	9·50	21	10·67	20	16 40	18	13 77	12	14 21	2	16·50	7	7·29
17	5·23	8	3·89	7	5·56	18	10 89	6	9·67	6	6·50	3	3·66	1	10·00	2	10 00
7	9·57	10	6 30	12	6·25	25	8·00	11	10 18	8	12·25	4	13·25	3	10·00	7	10 00
48	9·31	108	11·10	133	13·90	421	15·72	101	17·85	135	16·22	86	14·32	113	14·86	74	12·70

TABLE XIV.—ASHE INLET, Station "No. 3,"

Months.	No. of Observations.	No. of Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
1884.																
September.....	180	22	28	10·01	8	7·95	16	6·94	4	13·50	9	14·56	3	13·33	25	21·12
October........	186	20	37	16·65	9	11·22	16	12·69	4	8·75	2	7·00	4	9·00	34	22·97
November......	180	19	29	14·86	14	17·14	39	15·49	—	—	4	19·50	4	14·00	31	30·86
December	186	24	25	11·00	17	7·00	8	7·25	—	—	5	8·40	6	12·50	—	—
1885.																
January	186	27	30	5·63	—	—	2	6·50	—	—	8	15·63	—	—	10	12·60
February.......	168	32	19	6·05	14	11·71	9	8·88	3	10·00	19	19·95	25	30·72	15	13·46
March	186	35	14	6·89	4	12·50	6	8·83	1	6·00	4	5·75	4	13·75	9	10·88
April............	180	20	11	8·00	3	5·66	5	12·80	9	21·55	20	26·50	16	16·19	11	20·55
May..............	186	16	7	8·57	5	10·00	4	14·00	11	20·10	33	24·70	14	13·07	6	14·83
June	180	9	1	4·00	4	8·25	1	6·00	3	11·33	22	12·27	17	12·18	24	8·93
July	186	20	2	7·00	1	6·00	—	—	2	16·00	37	18·81	41	15·84	35	9·06
August..........	186	9	4	6·75	—	—	6	9·67	4	15·50	70	23·33	15	8·33	12	5·50
Year.......	2190	253	207	10·52	79	10·68	112	11·66	41	16·29	233	20·33	149	16·47	212	16·97

Year, 1st September, 1884, to 31st August, 1885.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
4	16·25	2	13·00	1	4·00	1	1·00	—	—	2	9·00	2	32·00	29	18·52	24	13·33
10	19·20	11	20·64	—	—	2	7·50	2	17·50	7	10·57	6	18·00	13	22·69	9	18·22
5	38·80	2	10·50	—	—	10	12·90	1	34·00	3	15·00	2	25·00	9	17·22	8	15·88
2	7·00	5	9·20	1	4·00	4	5·50	—	—	7	10·72	12	17·75	51	18·08	19	9·35
—	—	1	4·00	—	—	—	—	1	10·00	13	25·00	14	14·78	68	18·45	12	8·58
3	13·66	2	7·00	—	—	1	4·00	—	—	2	7·50	2	10·00	17	11·30	5	7·00
13	19·70	3	10·00	1	5·00	3	14·00	7	13·57	10	16·50	13	16·50	46	23·37	13	16·07
2	10·50	2	12·00	—	—	1	12·00	5	8·60	24	12·25	3	16·66	41	21·54	7	13·29
4	10·00	6	9·83	—	—	3	10·00	3	11·00	21	19 90	20	18·85	30	16·33	3	8·00
2	5·00	5	6·00	—	—	10	7·90	5	13·60	26	20·65	26	20·73	22	18·18	3	13·66
—	—	3	5·33	—	—	—	—	—	—	8	11·25	5	17·80	28	13·43	4	10·25
2	4·00	1	4·00	2	7·00	3	5·00	6	8·00	15	15·33	14	15·78	21	12·38	2	9·00
47	17·55	43	11·65	5	5·40	38	9·18	30	12·18	138	18·00	119	18·14	375	18·24	109	12·41

TABLE XV.—STUPART'S BAY, Station No. 4.—

Months.	No. of Observations.	No. of Calms.	N. Observation.	N. Velocity.	N.E. Observation.	N.E. Velocity.
1884.						
September	180	20	43	12·23	12	9·83
October	186	11	5	7·80	1	14·00
November	180	22	3	12·60	—	—
December	186	35	6	5·83	1	1·00
1885.						
January	186	37	1	20·00	—	—
February	168	46	9	10·44	2	8·00
March	186	34	3	11·33	—	—
April	180	21	14	11·07	13	11·23
May	186	17	23	11·78	18	8·44
June	180	21	25	8·28	22	7·50
July	186	66	13	10·77	3	10·00
August (20 days)	120	22	12	9·67	4	7·00
Year	2,124	352	157	10·46	76	8·81

1st September, 1884, to 20th August, 1885.

E.		S.E.		S.		S.W.		W.		N.W.	
Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
24	10·08	5	4·00	—	——	—	——	11	10·63	65	12·65
16	14 56	15	10·20	10	11·20	7	9·10	50	9·16	70	17·53
14	29·36	6	10·50	6	10·30	5	16 60	67	8·40	57	16·50
4	7·50	—	——	1	4·00	10	7 30	63	7·92	66	12·72
—	——	—	——	—	——	5	9·80	89	8·10	54	18·52
27	19·93	9	15·55	5	4 60	3	5·33	16	8·19	51	12·41
—	——	1	9·00	7	9·14	14	11·86	59	9·41	68	22·30
16	13·63	5	10 60	8	7·13	16	7·06	28	9·08	59	20·53
26	12·73	5	6·60	1	2 00	10	12·30	35	12·66	51	12·94
23	6·83	12	4 75	3	3·00	9	4·22	19	14·63	46	14·80
25	5 24	9	2·33	10	3·10	12	8·67	25	7·52	23	19·74
30	9·70	5	4·20	8	3 00	3	6·00	26	12 62	10	11·70
205	12 60	73	7·94	59	6 58	94	10·08	488	9·34	620	16·26

TABLE XVI.—PORT DE BOUCHERVILLE, Station No. 5

Months.	Observations.	Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
1884.																
September.	180	15	4	8·00	13	8·93	42	8·40	1	23·00	7	19·00	2	8·50	2	5·50
October.	186	21	27	13·63	4	5·25	12	11·17	...	....	16	12·62	2	14·00	4	22·50
Nevember	180	39	7	14·58	3	10·00	28	16·36	...	....	8	24·63	...	....	13	5·54
December	186	84	1	21·00	2	10·50	6	13·17	...	....	4	10·00	1	4·00	12	9·25
1885.																
January, ...	186	107	......	....	...	....	......	....	...	....	1	7·00	...	....	2	1·50
February	168	29	17	7·42	7	7·00	25	14·08	2	31·00	20	20·95	...	....	3	14·60
March.	186	87	10	11·30	3	13·33	8	9·88	...	....	6	7·84	...	....	...	....
April...	180	44	12	10·83	10	9·60	14	13·21	...	....	7	11·00	...	....	6	9·33
May..	186	28	14	13·07	9	6·66	34	11·35	2	21·00	10	10·90	3	14·33	2	10·56
June	166	2	19	10·00	11	10·18	28	8·28	...	....	10	4·00	1	4·00	5	6·40
July.	186	5	4	7·50	5	10·00	36	11·14	1	4·00	17	4·77	3	3·33	14	6·86
August	132	5	1	4·00	2	12·00	30	12·46	...	....	17	11·88	4	12·50	4	10·25
Year	2122	466	116	11·19	69	8·97	263	11·60	6	21·83	123	13·77	16	9·65	67	10·55

June fourteen observations missed. August observations to 22nd only.

—1st September, 1884, to 22nd August, 1885.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
......	....	7	7·72	1	13·00	27	8·78	4	7·25	26	9·77	3	17·00	26	11·69	...	....
5	21·20	5	12·40	.....	....	11	11·34	6	15·50	27	12·36	5	4·40	41	7·58	...	....
......	....	11	17 09	1	4·00	29	13·31	2	8·00	22	8·27	3	4·66	14	8·43	...	....
......	....	2	12·50	......	......	34	12·64	11	12·64	27	6 63	...	....	2	7·00	...	....
......	....	2	14·00	2	11·50	51	15·66	2	20·50	19	7·05	...	....	....	....	...	....
......	....	......	....	......	....	28	9·75	6	8·50	15	6·94	4	2·75	11	10·91	1	14·00
......	....	2	19·00	2	9·50	34	13 35	2	18 50	24	11·28	...	....	7	11·15	1	8·00
......	....	6	7·83	11	15·82	42	10·33	2	10·50	21	9·91	1	23·00	2	6·00	2	7·50
......	....	5	11·00	3	16·33	27	16·70	......	....	26	13·00	5	12·20	17	11·88	1	3·00
......	....	13	9·23	4	13·50	36	18·33	....	....	19	16·26	4	14·75	14	7·79	...	....
.....	....	18	7·17	14	11·00	55	15·60	......	....	6	14·17	1	6·00	7	17·00	...	....
......	....	7	12·86	4	16·85	44	14·13	......	....	9	14·00	1	14·00	4	21·75	...	....
5	21·20	78	10·89	42	13·21	418	13·73	35	12·20	241	10·47	27	9·66	145	8·81	5	8·00

TABLE XVII.—PORT LAPERRIÈRE, Station No. 6.—

Months.	Observation.	Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
1884.																
October	186	9	4	13·25	2	12·00	3	17·00	2	10·00	16	13·00	5	20·80	29	21·20
November	180	8	4	14 00	10	15·20	15	22·20	12	23·59	6	7·50	9	19·33	25	20·76
December............	186	9	2	12 00	5	13·40	17	13·35	11	16 82	5	15·80	2	4·50	35	6 86
1885.																
January..............	186	19	4	7·25	3	6·00	6	7·50	4	10·50	......	....	3	5·66	29	7·72
February	168	19	7	9·86	4	15·50	7	22·14	31	20·77	12	19·17	18	19·22	14	12·36
March	186	17	5	19·20	8	18·13	3	19·67	1	10·00	14	18·79	1	3·60	11	9·09
April..........	180	7	9	20·33	6	10·67	11	8·17	4	17·50	15	22·87	...	....	1	20·00
May	186	22	16	14·66	2	9·00	4	17·25	16	12·56	33	18·39	5	12·20	6	14·50
June	180	10	22	9·86	9	10 33	9	10·88	15	15·00	21	20·48	1	5·00	3	12·66
July.....................	186	10	7	12·29	2	4·00	3	6·00	2	16·50	9	18·78	6	20·83	6	15·17
August................	186	6	15	14·73	4	20·50	1	8 00	2	16·00	19	25·68	2	8 00	14	13·57
Year	2010	136	95	13·34	55	13·36	79	14·60	100	17·45	150	19·14	52	17 98	173	13·28

leven months, 1st October, 1884, to 31st August, 1885.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.	Observation.	Velocity.
8	14·13	4	21·00	4	11·50	17	12·48	10	11·90	24	17·42	16	19·62	28	17·43	5	14·20
6	17·33	11	13·18	13	18·40	11	12·91	12	8·25	13	8 39	12	16 92	5	21·80	8	10·50
27	10·93	19	17·58	14	16·43	12	8·50	5	10·60	4	7·75	2	9 00	11	10·64	6	14·67
47	12·89	56	18·89	4	13·50	7	22·86	...	....	...	....	1	6·00	1	3·00	2	10·50
20	14·05	21	11·30	2	11·00	5	7·60	1	10·00	1	2·00	2	15·50	1	13 00	3	10·66
47	8·51	37	13·73	18	13 77	6	13·83	3	10·34	6	13·67	2	19·50	2	16 00	5	15·60
24	11·42	23	17·65	24	21·79	9	13·44	12	12·25	11	12·18	5	11·20	11	9 91	8	16·38
3	22·00	7	24·71	7	14 57	9	16·22	13	16·68	11	14·00	12	13·83	12	14·58	8	16 00
......	....	5	7·40	6	13·33	19	12·37	12	9·17	15	7·73	7	14·57	15	8·73	11	10·82
15	11 00	31	16·13	49	12·24	35	10 23	2	5·50	...	....	......	....	3	9·66	6	12 00
8	15·13	14	15·85	23	12·26	45	11 91	6	12·83	6	8·67	1	3·00	10	10·20	1(	18·50
205	11 83	228	17·34	164	14·50	175	12·19	76	11·50	91	12·06	60	15·23	99	13 21	72	12·28

TABLE XVIII.—Table showing the Mean Temperature of the Air at Frederikshaab, in Greenland, taken from Mean of Observation, at 7 a.m. and 6 p.m., as published in Part I of "Contributions to Arctic Meteorology," issued by the British Meteorological Council. Observations taken by Mr. F. F. Barfoed.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1856	....	....	....	....	....	....	....	....	39·7	28·5	33·8	23·9
1857	19·0	6·8	20·5	28·9	35·6	41·4	42·5	43·5	39·5	27·3	21·0	15·4
1858	12·7	19·35	26·3	30 7	33·6	39 5	43·8	41·4	35·6	29·6	26·3	15·7
1859	11·5	16·00	15·7	29·9	36·0	39·0	41·0	38·2	37·5	30·5	23·1	21·4
1860	12·9	20·30	16·5	25·9	36·3	42·3	44·3	....	38·5	28·5	....	....
Means	14·02	15·61	19·75	28·85	35·3	40·55	42·9	41·0	38·15	28·88	26·05	19·1

Mean of year from above table is 29·18.

TABLE XIX.—Mean daily Temperature of Sea Water at the surface, with corresponding position of Ship.

Date. — Months.	Sea Temperature.	Position. Lat. N.	Position. Long. W.	Date. — Months.	Sea Temperature.	Position. Lat. N.	Position. Long. W.
	°	° ′	° ′		°	° ′	° ′
May 27...	....	Left Halifax.		June 17...	In close field ice.	61 8	65 32
do 28...	43·8	44 59	61 09	do 18...		61 12	65 24
do 29...	38 8	47 01	59 34	do 19...		61 8	65 56
do 30...	35·3	49 03	58 55	do 20...		61 14	66 18
do 31...	31 0	50 16	58 42	do 21...		61 16	66 26
June 1...	34·8	Blanc Sablon.		do 22...		61 14	65 35
do 2...	35·8			do 23...		61 21	66 26
do 3...	35·3			do 24...		61 22	65 45
do 4...	31·8	51 48	55 48	do 25...		61 19	65 37
do 5...	32·1	52 59	54 42	do 26...		61 20	65 24
do 6...	31·0	55 01	54 56	do 27...		61 20	65 29
do 7...	36·8	55 58	55 11	do 28...		61 17	65 2
do 8...	37·5	57 43	57 27	do 29...		61 8	64 33
do 9...	36·1	58 42	58 54	do 30...		61 14	64 54
do 10...	31 0	58 49	60 13	July 1...		61 15½	64 54½
do 11...	30·9	58 45	60 39	do 2...		61 15	64 27
do 12...	30 7	59 18	60 47	do 3...		61 7	64 27
do 13...	31·2	60 30	61 6	do 4...		61 11	64 42
do 14...	30·8	60 44	62 1	do 5...	29·8	61 15	64 38
do 15...	31·5	61 36	62 29	do 6...	30·0	61 15	64 37
do 16...	29 8	61 11	64 40	do 7...	33 0	61 1	63 20

TABLE XIX.—Mean daily Temperature of Sea Water, &c.—*Concluded.*

Date. — Months.	Sea Temperature.	Position. Lat. N.	Long. W.
		° ′	° ′
July 8...	35·6	60 56	61 41
do 9...	37·6	59 20	59 59
do 10...	40·8	57 45	58 51
do 11...	40·5	56 2	56 40
do 12...	46·6	53 28	55 17
do 13...	48·7	52 22	54 54
do 14 ..	49.4	50 55	53 47
do 15...	53·8	48 21	52 38
do 16...	....		
do 17...	....		
do 18...	....		
do 19...	....		
do 20...	....		
do 21...	....	In St. Johns, Nfld.	
do 22...	....		
do 23...	....		
do 24...	....		
do 25...	....		
do 26...	....		
do 27...	50·0		
do 28...	52·1	49 9	52 57
do 29...	51·8	51 29	54 35
do 30...	50·7	54 5	56 8
do 31...	41·5	56 21	59 22
Aug. 1...	34·2	58 48	10′ off shore.
do 2...	35·2	59 10	63 15
do 3...	30·7	60 32	64 30
do 4...	32·0	60 24	64 46
		In Burwell.	
do 5...	31·4	60 36	64 48
do 6...	31·3	61 23	65 29
do 7...	31·0	61 17	66 46
do 8...	31·1	61 46	68 04
do 9...	33·6	61 46	68 16
do 10...	30·8	62 00	68 36
do 11...	34·2	62 07	68 45
do 12...	30·6	Off Ashe Inlet.	
do 13...	29·9	Drifted 18′ west.	
do 14...	29·8	Ship a little farther west.	
do 15...	29·9	62 37	71 34
do 16...	30·0	63 00	71 27
do 17...	30·3	7′ west of Bluff.	
do 18...	30·0	14′ do	
do 19...	29·9	42 47	71 17
do 20...	29·8	20′ farther west.	
do 21...	36·7	60 59	72 7
do 22...	36·7	Noon in Stupart's Bay.	
do 23...	35·9	62 50	74 6
do 24...	34·5	Off S.E. part of Nottingham.	
do 25...	35·0	Diggs.	
do 26...	34·8	In Port Laperrière.	
do 27...	35·5		
do 28...	33·7		

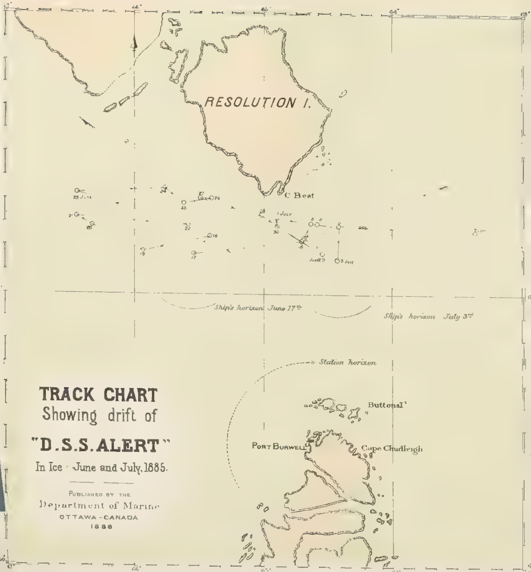
Date. — Months.	Sea Temperature.	Position. Lat. N.	Long. W.
		° ′	° ′
Aug. 29...	38·8	61 21	80 52
do 30...	38·7	60 40	85 2
do 31...	38·7	59 58	90 40
Sept. 1...	42·8	Off Churchill.	
do 2...	44·5		
do 3...	43·6		
do 4...	45 0	In Churchill Harbor.	
do 5...	43 7		
do 6...	44·8		
do 7...	39 9	59 12	93 32
do 8...	38·3	59 23	88 34
do 9...	38·4	59 12	83 35
do 10...	40·1	59 48	81 20
do 11...	41·5	59 48	80 10
do 12...	37·6	62 00	78 51
do 13...	32·5		
do 14...	31·8	In Laperrière's Harbor.	
do 15...	34·2		
do 16...	33·3		
do 17...	35·2	P.M. left Diggs.	
do 18...	33 0	A.M. at Nottingham, lat. 63° 11′; long 76° 20′.	
do 19...	32·0	In Ashe Inlet.	
do 20...	33 8	Off Stupart's Bay.	
do 21...	38·7		
do 22...	33 5	In Stupart's Bay.	
do 23...	31·0		
do 24...	31·7	61 29	70 21
do 25...	31 6	60 53	65 37
do 26...	31·4	61 2	64 41
do 27...	31·7	61 1	63 50
do 28...	30·5	60 30	64 4
do 29...	33·4		
do 30...	32·2		
Oct. 1...	32·5		
do 2...	32·2		
do 3...	31 9	In Port Burwell.	
do 4...	31·1		
do 5...	31·5		
do 6...	31·6		
do 7...	31·2		
do 8...	32·0	In Nachvak.	
do 9...	32·8	58 4	59 48
do 10...	33·6	55 17	56 54
do 11...	36 8	52 27	53 40
do 12...	35·7	51 12	52 2
do 13...	40 4	49 14	51 34
do 14...	44 6	In St. Johns.	
do 15...	46 9	47 11	52 42
do 16...	49·4	45 43	57 14
do 17...	51·3	Cranberry Island, N. ¼ W. 5′.	
do 18...	....	Halifax.	

TABLE XX.

WEEKLY Results of Meteorological Observations taken on board Dominion Steamer "Alert," 1885.

Week ending	Barometer at 32°.			Temperature.				Hours Snow.	Hours Fog.	Hours Wind, 25 miles and over.
	Highest	Lowest.	Range	Mean.	Max.	Min.	Range			
June 3	30 186	29·839	·347	40·52	50·7	31·9	18·8	......	2	4
do 10	·068	·405	·663	36·12	43 0	30·2	12 8	4	6	74
do 17	29·897	·135	·762	34 00	42·5	30·5	12·0	8	16	8
do 24	·887	·428	·459	33 55	42·1	27·0	14·1	40	12	......
July 1	30 282	·459	·823	34 88	40 8	30·1	10·7	18	8	6
do 8	·131	·749	·382	36·59	43 5	31·0	12·5	......	24	2
do 15	·117	·139	·978	48 05	62·8	38·5	24·3	......	60	2
Aug. 1	29 989	·457	·532	52 70	68·7	40·5	28·2	......	......	14
do 8	30·361	·856	·505	45·67	60·0	31·2	28·8	......	28	......
do 15	·008	·152	·856	36·75	43·0	31·3	11·7	4	40	4
do 22	29·982	·379	·603	36·81	43 0	32·9	11·1	......	16	8
do 29	30 056	·885	·171	40·24	57·1	34 0	17·1	.....	4	.....
Sept. 5	·078	·465	·613	41·94	48·0	37·2	10·8	4	.....	8
do 12	·253	·827	·426	40 12	46 0	34·0	12 0	4	16	16
do 19	·205	·747	·458	33·80	39 0	31 0	8 0	......	12	40
do 26	·205	·034	1·171	32·49	39·8	21 0	18·8	56	......	80
Oct. 3	·182	·342	·840	33·06	45·0	29·3	15·7	16	.....	92
do 10	·418	28 956	1·462	32·70	37·0	30·0	7·0	40	.....	32
do 17	·411	·728	1·683	41·75	54·0	34·0	20·0	32	.....	92
Season	30·418	28·728	1·690	....	68·7	21·0	47·7	226	248	482


CHART
Showing the track of the
"D.S.S. ALERT"
HUDSON'S BAY EXPEDITION
1885
PUBLISHED BY THE
Department of Marine
OTTAWA-CANADA
1886
GREENLAND
DAVIS STRAIT
FOX CHANNEL
HUDSON'S BAY
HUDSON'S STRAIT
FROBISHER BAY
RESOLUTION I
PORT BURWELL
UNGAVA BAY
LABRADOR
NAIN
RIGOLET
NORTH ATLANTIC OCEAN
NEWFOUNDLAND
St Johns
JAMES BAY
MOOSE FACTORY
Mosquito Bay
OTTAWA ISLANDS
C Churchill
Mansfield
Anticosti
R St Lawrence
Quebec
Montreal
Ottawa
HALIFAX
Bay of Fundy
Prince Edward I
95°
90°
85°
80°
75°
70°
65°
60°
55°
50°
45°


RESOLUTION I.
C Best
Ship's horizon June 17th
Ship's horizon July 3rd
Station horizon
Buttons I.
Port Burwell
Cape Chudleigh
TRACK CHART
Showing drift of
"D.S.S. ALERT"
In Ice · June and July, 1885.
Published by the
Department of Marine
OTTAWA - CANADA
1886
L. W. of Greenwich

REPORT

OF THE

HUDSON'S BAY EXPEDITION OF 1886

UNDER THE COMMAND OF

LIEUT. A. R. GORDON, R.N.

View of Port de Boucherville, Nottingham Island, August, 1884.
From a Photo. by Dr. Bell, Geological Survey. Published by permission of Prof. Selwyn, C.M.G., Director.

View of Port Laperriere, Outer Digges Island.

From a Photo. by Dr. Bell, Assistant Director of the Geological Survey. Published by permission of Prof. Selwyn, C.M.G., Director.

J.W Tyrell P.L.S Fec.

REPORT

OF THE

HUDSON'S BAY EXPEDITION OF 1886

UNDER THE COMMAND OF

LIEUT. A. R. GORDON, R.N.

REPORT

OF THE

HUDSON'S BAY EXPEDITION OF 1886,

UNDER THE COMMAND OF

Lieut. A. R. Gordon, R.N.

TORONTO, 18th March, 1887.

The Hon. GEO. E. FOSTER,
Minister of Marine and Fisheries,
Ottawa.

SIR,—I have the honour to submit herewith the report of the Hudson's Bay Expedition of 1886.

The report is divided under the heads of:—

Narrative,
Ice Observations,
Notes by Observers,
Resources of the Hudson's Bay Region,
Meteorological Observations,
Report by Mr. F. F. Payne on the Flora and Fauna of Stupart's Bay,
Report by Dr. R. Bell on Economic Minerals, &c.,
Concluding remarks on the Navigation of the Straits.

NARRATIVE OF THE VOYAGE OF THE DOMINION STEAMER "ALERT," 1886.

In accordance with your instructions, I left Toronto on 1st June, and after meeting you in Ottawa, proceeded to Halifax to superintend the fitting out of the ship, and the purchase of all the necessary stores, provisions, &c.

On 24th June, all stores being on board, and the crew shipped, I received from you the following letter of instructions:—

"OTTAWA, 22nd June, 1886.

"To LIEUT. A. R. GORDON, R.N.,
"Halifax, N.S.

"SIR,—With reference to the voyage of the 'Alert' and the work to be performed under your charge for the present season, it is desirable that you should be guided by the following instructions, which are intended rather as an index of the general wishes of the Department, than as an absolute direction from which you are under no circumstances to deviate. Changes that may be rendered necessary, by circumstances now unforeseen, and other work than that indicated which may appear to you proper to be done during the course of your voyage, are to be within your own discretion, always bearing in mind the purpose of the expedition, and the time at your disposal.

"It is desirable that you should proceed to the mouth of Hudson's Straits with as little delay as possible, so as to avail yourself of the very first feasible opportunity to make the passage through. If you are prevented from at once entering the Straits, you will occupy your time in taking accurate observations of, the extent and condition of the ice, the prevailing winds, and the currents at its mouth.

"At the earliest possible period consistent with the safety of the expedition you will push through the Straits, in order to demonstrate the earliest date of opening navigation and the time required to pass through the ice, noting carefully all the incidents of the passage.

"Unless necessity exists for visiting any of the stations, of which you will be advised by the system of signals agreed upon, you will not lose any time in visiting them during your outward voyage.

"After having made your way through the Straits and taken all necessary observations, it will be advisable for you to push forward to the western coast of the bay, and employ the time at your disposal with carefully examining Churchill Harbour and the Nelson River, flowing into the bay, taking all necessary soundings and observing the lead of this river up to Seal Island, with a view to ascertaining the suitability of these harbours, for the reception and security of vessels and the purposes of trade.

"In addition to this, any information, hydrographical, geological or with reference to the fisheries of that region, which you can gather, should be as carefully and completely collected as opportunity permits.

"It would be well to delay your homeward voyage through the Straits to as late a period as is consistent with safety and the labour involved in gathering the men and plant of the observing stations, in order to gain whatever data you can as to the condition of the Straits at the latest period of navigation.

"The observers, the houses and all portable and valuable articles at the stations you will take on board the 'Alert' on your return voyage, and bring them with you to Halifax.

"You will bear in mind that it is the wish of the Department to demonstrate as far as possible the navigability of the Straits, for purposes of commerce, in point of time and facility, and anything that will conduce to that end the Department relies upon you to do to the limit of the means placed at your disposal.

"I am, Sir,

"Your most obedient servant,

"GEORGE E. FOSTER."

On receipt of this letter, I immediately prepared for sea, and sailed from Halifax, leaving the Departmental wharf at 3 p.m. on the 24th of June.

There were borne on the ship's book at this date:—

1 captain,
3 mates,
1 meteorological assistant,
1 boatswain,
20 able-bodied seamen,
1 lamp trimmer,
5 stewards and cooks,
2 engineers,
2 oilers,
6 stokers.

Capt Markham, R.N., also accompanied the expedition as the representative of the Winnipeg and Hudson's Bay Railway Company, making 43 persons in all on board at the date of sailing.

We commenced this voyage with every hope of making an early and successful passage of Hudson's Straits, as the news from Newfoundland was that the ice had left the Labrador coast, and that the season, so far as the movements of the ice were concerned, was an unusually early one. Our subsequent experience showed that certainly, all along the Labrador coast, and to a less extent in Hudson's Straits, the season was earlier than last year.

We were hardly clear of Halifax harbour, when a dense fog settled down, which necessitated keeping the engines at half speed, the ship making about $4\frac{1}{2}$ knots per hour ; with occasional slight lifts, in which any object, such as a ship, could have been seen at a distance of half a mile to a mile. This fog continued till 5 p.m. of the 26th.

On the 27th we had strong head winds and a heavy sea, against which the ship only made about 2 knots per hour.

On the 28th we had light fair wind, and smooth water, which gave us an opportunity to test the speed of the ship under steam. Working with the expansion gear on, cutting off steam at $\frac{1}{8}$ stroke on the high pressure cylinder, and burning 400 lbs. of Welsh coal per hour, the ship made 7 knots per hour ; which, considering her then deeply loaded condition, was a most satisfactory result. The quality of the coal was excellent, the ashes were all burned over, and in the six hours' steaming trial, when nearly 2,500 lbs. of coal were consumed, the final ash residuum was only about 220 lbs. This fuel gave, according to this test, a consumption approximity of $4\frac{1}{2}$ tons per 100 miles of distance, so that even if I allowed 5 tons, I felt satisfied that I was carrying coal sufficient for a distance of nearly 8,500 miles in clear water, and as I estimated my total distance for the voyage at about 6,400 miles, the reserve for delays by ice was ample.

On the 29th, at 8.30 a.m., we arrived off Blanc Sablon, and, stopping for a short time, sent away a boat with letters for home. These were given in charge of a boat's crew, employed by Captain Blandford, of Blanc Sablon, who had kindly offered to see to the forwarding of any mail matter which we might at any time leave there. At 9.30 a.m. our boat having returned loaded with a very acceptable supply of fine fresh codfish, we proceeded on our course, keeping close in under the north shore. The day was misty, with occasional showers of rain, but the wind being light and the sea smooth, the speed of 7 knots was kept up all day. At 4 p.m. within our limited horizon, 20 icebergs were counted, most of them aground near the north shore of the Straits.

On the 30th of June, while steaming up the Labrador coast, large numbers of small icebergs, called growlers, were passed, but very few large ones. These growlers are the fragments of large bergs which often break up when they go aground about this part of the coast. All this day we had a fresh breeze from the N.E., with cold weather. The wind was bitingly keen, and it was very noticeable that there was no swell, the sea being as smooth as possible though the wind was strong enough to have raised a fairly heavy sea—about 10 p.m. the sea began to get up, and the appearance of the sky to the eastward, when the weather cleared up in the evening, convinced me that we had been passing to leeward of a considerable body of field ice, which must have extended over 60 miles of latitude, and have been of considerable breadth to have prevented the sea from getting up.

On 1st July, passed the Bull Dog Island about 3 a.m., had a fine fair breeze all day, the ship running eight knots under steam and sail. A number of icebergs were passed to-day, some were very large, one particularly so, towering up to a height of 160 or 170 feet above the sea.

July 2nd. At 7 a.m. the wind shifted to north, accompanied by thick weather and snow showers. Loose field ice was now seen ahead ; but, in the then condition of the weather, I thought it best to lie off the edge of the ice till it should clear up. At 7 p.m., tacked ship and again stood to the north ; by midnight the wind had abated, and the ship was making good way on her course, having passed the ice which was sighted in the morning. Quite a number of bergs were passed to-day. At 10 p.m. there were nine very large ones, all close together, near the ship.

July 3rd. At noon arrived off Cape Mugford, and met the field ice. It was loose and rotten, the ship making six knots without much yawing; steaming along the coast through this loose ice all day; weather fine and clear.

Sunday, 4th. About 3 a.m. arrived off Gulch Cape, and found the Bay between this promontory and White Bear Cape full of tightly packed heavy ice, through which it would have been impossible to force the ship. I was, therefore, reluctantly compelled to abandon the attempt to call at the Nachvak Post, and, heading the ship out to the eastward found comparatively clear water about fifteen miles off the land, when course was altered to the northward, for the entrance of Hudson's Straits.

Monday, 5th July. The weather set in thick, a dense fog hanging over the land; at one time the ship was closely beset for a couple of hours, the ice having run tight together with the tide. While the ship was fast, I had the thickness of a number of the pans measured, they ranged from 5 to 12 feet; occasionally pieces of much greater thickness were met with, but the extra depth in these cases was due to the "rafting" or piling of pan on pan, a process which is almost continually in operation whenever the ice takes against the shore, or against other ice, under the influence of wind or tide.

July 6th. The weather continued thick all day till 4.30 p.m., and no progress was made, ship being beset most of the time. Measures of the thickness of the ice were again made; one piece to which the ship was tied up for the great part of the day, was 300 yards by 180 yards, and the thickness measured at many points on its edge averaged 12 feet. At 4.30 p.m. the fog lifted a little; steamed N.W. for 16 miles when it again closed down and we had to stop and make fast to a floe piece.

July 7th. The fog continued till 9.30 a.m, when heavy snow set in, turning to sleet after a short time, the weather clearing again about 11.20 a.m. There was, however, no opportunity for obtaining observations for position, and though the land was sighted close to, the fog hung over it so close down to the water that it was impossible to identify any part of it.

8th. The weather to-day continued thick up till noon, when it cleared up, and showed us that the ship had been carried south, about 30 miles. The soundings taken whilst steaming off the land show a depth of less than 100 fathoms up to 10 miles off shore, a result somewhat unexpected, as the coast here is high and precipitous, at some places rising abruptly from the water's edge to heights of 1,200 or 1,500 feet. At 1 p.m. cast off from the pan to which we were fast, and steaming out to the eastward got into clear water and headed to the northward following the edge of the ice.

9th. At 5.30 a.m got round the northern edge of the ice and entered Hudson's Straits at 6 a.m. The fog again shut down densely thick; this continued with an occasional lightening up till noon, when the weather cleared for a short time, but only to shut down again. All this day we have been passing heavy loose ice, steaming either half speed or dead slow.

10th. Another foggy morning, but clearing up for good at 7 a.m. At 9.30 a.m. met a stream of loose ice extending north and south as far as could be seen; at 10.30 a.m. got into perfectly clear water and shaped course for North Bluff. All this day heavy ice was visible lying to the south of our track, the late northerly winds having apparently packed the ice down on the south side of the Strait. A shift of wind to the southward would speedily have brought it back and checked our progress. We saw to-day the first "right whale" of the season.

11th. Arrived at Ashe Inlet at 4.55 a.m., and found Mr. Tyrell, P.L.S., the observer in charge, and his assistants, Messrs. Mills and Creelman, in excellent health; they had been plentifully supplied with fresh meat by the natives all through the winter, and had a large quantity of fuel still unused. I took Mr. Tyrell on board as surveying assistant, leaving Messrs. Mills and Creelman to carry on the observations, and proceeded to sea again at 6 a.m. Mr. Tyrell informed me that the SS. "Arctic," Capt. Guy, owned by the Messrs. Stephen, of Dundee, had arrived at his station on the 5th of June, being then three weeks out from St. John's, Nfld.

I have since heard from Capt. Guy, and the accompanying ice chart shows the track he followed.

On the 25th May, when to the east of Monumental Island, the "Arctic" was beset by the ice and carried helplessly round Resolution Island, only being set free on the 2nd June, when near the Lower Savages Island, and this, though she is one of the most powerful of the Dundee whaling fleet. This is the same region in which the "Alert" was caught last year, her drift being shown in the chart accompanying the Hudson's Bay Expedition Report, 1885.

Capt. Guy stated to Mr. Tyrell that he intended on leaving Ashe Inlet to, if possible, proceed westward through Hudson's Straits, and to pass between Mansell and Southampton Islands, then to cruise in Hudson's Bay, and passing up the Roe's Welcome, to go through Frozen Strait into Fox Channel, thence through Fury and Hecla Straits into the Gulf of Boothia, and home by Lancaster Sound. Capt. Guy, in fact, reached Repulse Bay on 1st August, but found Frozen Straits fast the whole summer, and had to return by way of Hudson's Straits.

After leaving Ashe Inlet, I intended going across the Straits to, if possible, communicate with Mr. Payne at Stupart's Bay, but about six miles off the north shore the ice lay in one compact mass, which it would have been useless to attempt to force a passage through. Heading to the westward, I followed the edge of the pack for about twenty-five miles, and as there was no apparent change, and the edge of the ice here trended north, following the lay of the land, I took the pack and began working through.

Events subsequently showed that there lay, at this time, between the ship and the open waters of Hudson's Bay, a body of ice fully 200 miles in width. Much of this ice was very heavy and the sheets of great extent, several were upwards of a mile in length, and though the upper crust of snow was soft and overhung the ice below, the latter was as hard as flint. I had taken the pack, and commenced boring through at this point in preference to following the lead of open water to the north, because I had found previously that near the centre of the Straits, at this point, the ice almost invariably slacks about the turn of the tide for a longer or shorter time. A glance at the chart shows, that as the current flows most strongly westward on the north shore, and eastwards on the southern, with Charles Island right in the eddy between these currents, the geographical conditions are favourable to this movement, whilst to the north or south, once well into the pack, the whole swings with each tide almost as immovable as a single sheet.

Capt. Guy says in his letter: "But after leaving there (Ashe Inlet) we found it (the ice) of a much heavier nature, being from 15 to 20 feet thick * * * and were afterwards steaming between Cape Queen and Charles Island from the 20th June to 25th July trying to get into Hudson's Bay."

Capt. Guy tried too far north at first. Had he worked through on the same track as the "Alert" I think it, judging from the reports of the stations at Nottingham and Digges, not unlikely that he might have got through early in July.

12th. At 1.30 p.m. to-day, whilst ramming at a taut bar of ice, the screw struck a piece of ice, and one blade was broken off. Got propeller on deck and shipped a new blade, going ahead with the engines again at 4.40 p.m. Ice continued heavy all day, slacking off and tightening up again apparently with the phases of the tide.

13th, 14th. Ice continued heavy, and I here quote from my journal of the 14th the opinion then written, which subsequent events only tended to confirm:—

"The ice met with to-night, in my opinion, settles the question of the practicability of the navigation of the Straits; up to this date, at any rate, the Straits are not navigable for this season, because no ordinary ship that could be used as a freight carrier, even if strengthened to meet the ice, could have stood the pounding, which this ship has had this afternoon."

15th, 16th, 17th, 18th. Working as opportunity offered to the westward.

19th. At 10 p.m. got close up to the outer Digges Island, where the station of Port Laperrière is situated, but the shore was lined with heavy ice, the board ice

being still fast to the rocks, and, as the weather was unpromising and the tide about to turn, I hauled off for the night.

20th. This morning, after considerable difficulty, succeeded in getting into Port Laperrière. The ship was tied up for two hours to the shore ice under the lee of a point whilst the running ice was going past at the rate of four knots an hour, occasionally striking the ship heavily. After two hours, the breeze having freshened, the board ice parted from the rocks. Fortunately for us the tide had been running long enough to leave a little open water between the running ice and the rocks, and, slipping the lines, we steamed up this narrow lead and got safely into harbour.

Mr. Percy Woodworth and his two assistants, Messrs. Bissett and Bowditch, who had been at this station, came on board over the ice. They had all enjoyed excellent health, and they reported having spent a pleasant and comfortable winter. Mr. Woodworth stated that the harbour ice had only broken up a few days before our arrival, and it is worthy of note that this occurred nearly a month earlier this year than last year, thus showing that both at the eastern and western ends of the Straits the season was a full month earlier than that of 1885.

The 20th, 21st, 22nd, 23rd, and 24th were spent in harbour here, to enable the engineers to make some necessary repairs to the engines. Observation for position and observations of the magnetic elements were also taken.

25th. At 5 a.m. weighed and proceeded out of harbour, having previously examined the condition of the ice from one of the hills. We were, however, only able to make about nine miles when the ship was closely beset, remaining fast all day, the ice swinging with the tide.

26th. At 7.40 a.m. the ice suddenly ran abroad, and by 9 a.m. we were steaming full speed. Dense fog continued till late in the afternoon, which was most unfortunate, as from the position given on the "Arctic's" track the two ships must have been within a few miles of each other on this day.* At 6 p m. no ice was in sight, except a few scattered pans on the horizon. As soon as the ship was clear of the ice, the regular series of soundings were commenced, and every possible observation taken to determine with accuracy the position of the ship.

27th.—A little loose and rotten ice was met with this morning, but nothing which in any way interfered with our progress, nor were we at any time seriously delayed by ice throughout the remainder of the voyage. About 7 p.m., passed Cape Southampton, but as the weather was somewhat thick at the time it was not sighted.

I had now to decide, whether to follow my original intention of visiting the north-west portion of the bay, or to go direct to Churchill and York Factory, to perform the surveying work, which you had desired me to undertake at those places. After careful consideration, I finally decided to make for Churchill, as I was of opinion that the chances of fine weather for this work were more favorable in the early part of August than they would be later on. The run from Cape Southampton to Churchill was an excellent one, the ship making eight knots nearly the whole time. A little loose ice was met with early on the morning of the 28th, but otherwise there was nothing of interest occurred, and we arrived and anchored in Churchill Harbour at 5.15 p.m. on the 29th, having made the run from Cape Southampton in forty-six hours.

From 30th July to 3rd August we were engaged in making a survey of Churchill Harbour, a copy of this plan has been forwarded.

The Harbour at Churchill is formed by the mouth of the Churchill River, which empties itself into Hudson Bay at that angle in the coast lying between Cape Churchill and Seal River. Between these points the older rock formations come right down to the sea,

At its mouth the Churchill River flows nearly north (true). The estuary itself is narrow, being only about 600 yards in width. At this point the tide runs with very considerable velocity—estimated at half-tide to run about six knots. The basin

* Note.—This was written before the final examination of the station records. The "Arctic" was seen passing Digges' Island on the 27th and so was a full day behind us. Captain Guy in dating his track has misdated this noon position.

Mortimer & Co. Ottawa

J.W. Tyrrell P.L.S. Draftsman

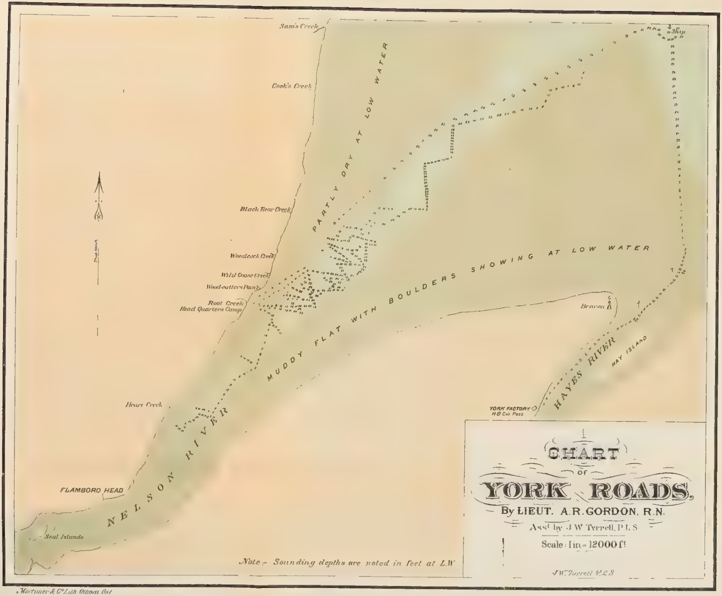


CHART
OF
YORK ROADS,
By LIEUT. A.R. GORDON, R.N.
Ass^t by J.W. Tyrrell, P.L.S.
Scale: 1 in = 12000 f^t
J.W. Tyrrell P.L.S.
Sam's Creek
Cook's Creek
Black Bear Creek
Woodcock Creek
Wild Goose Creek
Wood-cutters Point
Root Creek
Head Quarters Camp
Heart Creek
FLAMBORO HEAD
Seal Islands
NELSON RIVER
PARTLY DRY AT LOW WATER
MUDDY FLAT WITH BOULDERS SHOWING AT LOW WATER
Ship
Beacon
HAYES RIVER
HAY ISLAND
YORK FACTORY
H.B. Co. Post
True North
Note.- Sounding depths are noted in feet at L.W.
Mortimer & C^o Lith Ottawa Ont

for anchorage, with a depth of over four fathoms at low water, is about 1,500 yards north and south, by about 1,000 yards east and west; at two points, leads of from 100 to 200 yards in width carry this depth up for a considerable distance further, and it is in the eastern one of these that I have always anchored.

The holding ground is excellent, the bottom being mud, and though the tide runs very rapidly this harbour is an eminently safe one.

The approaches to Churchill are well marked, and in clear weather the land stands out bold and high, being easily identified at a distance of from ten to twelve miles. In thick weather the rule for making this harbour is to steer in W.b.S., *keeping in 20 fathoms of water*. If shoaler water than this is met with haul up to the north at once, till the water deepens to 20 again. At first the bottom is hard, limestone, coral and gravel. Keep on this W.b.S. course till the lead shows soft mud, when you are in the lead of the river; then alter course to S ½ W., which will bring you right down on Mosquito Point. Keep the lead going, and do not shoal the water to less that ten fathoms. The soft bottom in the lead of the river can be readily distinguished, even at a distance of eight miles from its mouth, and there is no danger in approaching to this distance when the above rules are observed.

This harbour is admirably suited for a railroad terminus. The necessary docks could be easily and cheaply built, and the deep-water basin enlarged at small cost. Stone is lying at the water's edge ready to be laid into docks and piers, and nature seems to have left little to be done in order to make this a capacious port fit for doing a business of great magnitude.

On the 4th of August at 9 a.m. weighed and stood out of harbour for York Factory. On first leaving the harbour soundings were made at five minute intervals, and subsequently throughout the entire trip every half hour. The afternoon being cloudy with a freshening easterly breeze and a falling barometer, I had to keep the ship further off the coast than I should otherwise have done; and though the soundings are thus, perhaps, of less value than they would have been had we been able to keep the coast in sight the whole way, they are still of value as showing the very fair degree of accuracy of this part of the chart.

August 5th. This morning during thick fog came up with a lot of ice, and as the weather continued thick we had to lie off all day.

August 6th. The weather was bright and clear; steamed in for the lead of the Nelson River at daylight, and at 8 a.m. anchored in 5 fathoms of water with the Point Marsh Beacon bearing S b.W. about 10 miles.

Lowered the steam cutter and left the ship for York Factory at 1.30 p.m. with whale boat in tow of steam cutter. Before getting into the Hayes River the breeze had freshened considerably and the cutter shipped so much water that I did not consider her safe for use as a sounding boat in an open roadstead. I therefore made arrangements with the agent of the Hudson Bay Company for the hire of one of their large schooner-rigged boats.

Captain Markham, R.N., who had up to this time accompanied the expedition, as representative of the Winnipeg and Hudson Bay Railroad Company, here left the ship, going to Winnipeg *viâ* the Hayes River canoe route. In accordance with your instructions, I furnished Captain Markham with provisions for himself and party, and procured for him the use of a canoe.

I was now engaged in making a reconnaissance survey of the estuary of the Nelson River. I fixed my headquarters camp at the mouth of Root Creek at a distance of nearly 17 miles from the ship.

Some idea of the difficulties encountered in performing this work may be formed from the following: The ship was lying 9 miles from the nearest land, 17 miles from headquarters camp and 28 miles from the proposed terminus of the railway, yet but little more than a mile from the point shoal, with only 6 feet of water on it, with a tide of nearly 3 knots. The following is the report on the survey made at the so-called Port Nelson:—

Port Nelson is now misnamed, the name being applied at present on the Admiralty charts to the bay lying between Cape Tatnam and the Nelson Shoals. The

name was originally given by Sir Thomas Button to the river itself, the bay into which the rivers flow he called Button's Bay. Sir Thomas Button wintered his ships in the Nelson River near the mouth of a small creek; his winter quarters must have been above Flamborough Head, as he describes the river at that place as being less than one mile wide. Port Nelson was so named after the master of one of his ships who died during the winter. The fact of the name being thus entered on the chart may have led people to believe that some harbour existed at this point. The Nelson and Hayes Rivers here empty their waters into Hudson's Bay, and on the tongue of land lying between the mouths of these rivers is built York Factory, the great *entrepôt*, in years gone by, of the Hudson's Bay Company.

The site was selected by the company, not on account of the existence of any harbour for the security of their shipping, but because the Hayes River was the best boat and canoe route to and from the interior.

Formerly this route was the great, if not the only, means of communication with the early settlers of the Red River and Selkirk Settlements, and it at one time required two ships of considerable size to carry out the goods, not only for the company's trade, but for the use of the settlers. At that time the company's ship did not come in to the fort, but the freight was discharged in the outer roads into schooners, which the company kept in the bay; these took the freight up the river to the Factory, taking out the return cargo in the same way.

Of late years, other means of communication with the North-West Territories having been established, the freight requirements of the company's trade at this post have been much decreased, and for several years past a small brigantine, drawing from 9 to 11 feet of water, has done all the work for the York and Churchill district, and this small vessel has frequently taken the ground both going in and coming out. The outer anchorage in the lead of the Nelson River is ten miles from the nearest land, which is so low as to be out of sight from the deck. The tidal currents at this point runs from two to two and a-half or even three knots per hour, the direction varying with the time of the tide. The only distinguishable object is the Point Marsh Beacon, which towers up 80 feet above high water, and without which it would be almost impossible to make the anchorage even in clear weather.

In thick weather a ship must keep right out in thirty fathoms of water, or she may find herself carried in by the tide, when she cannot get out again.

A shoal (Point Marsh Shoal) extends out for over eight miles, and has less than six feet of water on it; and when it is borne in mind that the surrounding land is uniformly low and level, with no natural features which could be used as leading marks, some idea of the difficulty of taking a ship into this place may be realized.

It is undoubtedly true that a channel does exist in the lead of the Nelson River, but it is both narrow and somewhat tortuous, and would have to be closely buoyed throughout its entire length from the anchorage to Seal Island, a distance of about twenty-seven nautical miles. The Indians say that the channel shifts from year to year, and I have no doubt that their statement is correct.

The mouth of the river from Sam's Creek to Point Marsh Beacon is ten miles across, and the channel at this point less than a mile in width. It narrows opposite Black Bear Creek to about 2,000 feet, and two miles east of Flamborough Head, where the river is still between two and three miles wide, the channel has narrowed to 200 feet.

In order to make a channel and basin capable of accommodating freight-carrying vessels much dredging would have to be done, and besides the 27 miles of closely buoyed channel a lightship would have to be moored some distance from the outer anchorage to enable ships to come in if the weather was partially clear.

A great deal of fog hangs over the bay in the months of July and August, and much delay, if not disaster, would be sure to occur if vessels were to attempt to make this port in anything but the finest clear weather, and as we met a lot of loose ice, which was very heavy, off the mouth of the river on the 5th of August, the lightship could not be placed in position till all danger from this cause was gone.

The cost of the construction and maintenance of a harbour at this place together

with the inevitable risks of navigation in approaching it, even after all had been done that could possibly be done, to render it safe and accessible, would, in my opinion, far outweigh the construction of the necessary additional mileage of railway required to reach the port of Churchill.

The channel which I have been considering is one of 18 feet at low water, which as the rise and fall averages 12 feet, would permit the passage of a 2,000 ton steamer, drawing 19 to 20 feet at half tide, as the distance from the anchorage to the proposed port is so great that a vessel could not afford to wait and go in at the top of high water.

I consider that the estuary of the Nelson River is one of the most dangerous places in the world for shipping to go to. At the outer anchorage the sea in a north-east gale breaks from the bottom, and the captains of the Hudson's Bay ships, if the barometer is falling and the weather threatening, will go to sea in the afternoon and lie off till the weather clears again.

The "Alert" lay in five fathoms at low water with 35 fathoms of chain out, but steam was ready for instant use the whole time and the cable buoyed and ready for slipping. One night during an easterly gale which she rode out at her anchors, Capt. Barrie, my first officer, who was in command at the time, reports, that had it not been for the ship being fitted with tanks and tubes for running oil he would have been compelled to slip and go to sea. The tide carried the oil to windward and kept the sea from breaking over the ship, though she was straining heavily at her chains and rolling the boats to the water all through the night.

I can only now repeat my previously expressed opinion, that the Nelson River is no port, nor would the expenditure of any amount of money make it a desirable place for shipping.

August 14th. Having now completed the survey so far as it was in my power to do so, I left York Factory.

I desire to acknowledge the courtesy and assistance which I received from the officers of the Hudson's Bay Company, both at Churchill and York. At York Mr. Matheson chartered to me one of his large schooner-rigged boats, and also furnished me with an interpreter and two Indian pilots, who had a thorough knowledge of the channel of the river, and thus saved me much time.

August 15th. Steaming round the coast to Churchill, weather fine and clear.

August 16th. Anchored in Churchill at 8 p m. I had determined to remain here a few days to shift coal, take in ballast, &c., &c., and also to obtain sights for time, which, with these taken here in July, gave me the rates of my chronometers.

When we anchored here this morning, the tide was running out strong, and the chain fouled the anchor stock, the result being that the ship dragged her anchor and took the bottom, at 11.30 a.m.; she sat on the mud till 5 p.m., when, as she floated, I weighed anchor and steaming out anchored again.

We remained here till Friday, the 20th, at 3 a.m., on which day we left for Marble Island, steaming up the western shore of Hudson's Bay, sounding regularly and plotting such portions of the coast line as we approached near enough for that purpose. Eskimo Point was passed as closely as was deemed consistent with safety on the morning of the 21st, and then as the weather was thickening up and somewhat threatening in appearance, headed off for Marble Island. All this night and the following morning had a great deal of trouble with the compasses—the steering compass, a U.S. Navy spirit compass of the best manufacture, and comparatively new, was so sluggish as to be useless, and the Sir Wm. Thompson standard was at times much disturbed, at one time swinging to S.S.W., and staying there for a time, our course then being north (magnetic.)

On the morning of the 22nd the same thing occurred. The disturbance on the night of the 21st was co-incident with the sudden outburst of a very brilliant aurora, that on the morning of the 22nd, happened after sunrise, so that no aurora could have been seen even had one existed. As the sun was shining at the time of the second disturbance, I at once removed all the correcting magnets of the Sir Wm.

Thompson compass, and readjusted it, after which it for a time worked fairly well, though on the occasion of our leaving Marble Island trouble again arose.

22nd. Arrived and anchored in outer harbour at 10 a m. On the Deadman's Island I found a letter from Capt. A. P. Benton, of the bark "Wave," which read as follows:—

"MARBLE ISLAND, 1st August, 1886.

"Wintered in the outer harbour in company with the 'George and Mary.' Had a mild winter, but cold and backward spring, the thermometer not reaching 30° till 19th May. Commenced cutting trenches 18th March, but did not get out till 16th day of June. The 'G. and M.' got out 12th June.

"Cruised all over Hudson's Bay the rest of June and July. Saw only one cow and calf, got her, 145 brls. Spoke 'George and Mary' 16th July, clean, bound to Repulse Bay; she saw one whale but did not get him.

"'Welcome' full of ice; did not see a whale there. On 16th July the ice extended from Whale Point across to Cape Harding. The whale I saw was on 2nd day of July; saw nothing in June.

"In February scurvy began to come on the crew. First natives came to the ship 21st April; bought one deer, afterwards bought five more deer. In middle of May things looked blue. The 28th of May we were sawing ice in nine fathoms of water, and the ice was on the bottom. We used between the two barks nearly forty bomb lances to blow the bottom of the ice out. The pack was fast to the floe, 1½ miles, ever since January; could not do anything with it. The 1st of June the pack broke off from the end of Deadman's Island and afterwards we got along quite well, sawing. The ice in the harbour was 7½ feet thick. Nearly one-half of the crew of both vessels were down with scurvy and the remainder more or less afflicted with it; but we got along quite well after we got out. All are in good health now.

"I leave here to-morrow for a short cruise and home.

"ANTHONY BENTON,
"*Master of the Bark "Wave," New Bedford, Mass."*

This letter shows that two whaling vessels wintered in Hudson's Bay for the purpose of prosecuting the whale fishery, and as only one had wintered there in each of the two preceding winters it would appear, that the New England whalers have not in any way lost confidence in Hudson's Bay as a whaling ground. Curiously enough the letter omits all mention of the death of one of the sailors whose newly made grave and neat wooden cross is now one of the first objects to meet the eye when landing on the island.

This harbor is very small, and gives no shelter from E. or S. E., but is the best ballasting station that I have found anywhere in either the Bay or Strait. Some idea of it may be gained from a knowledge of the fact that, working with three boats, we took in nearly eighty tons of ballast between 5 a.m. and 3 p m. of the 23rd August. As soon as this ballast was on board I put to sea, the weather having a very threatening appearance and the wind freshening from the S. E. with a steadily falling barometer and a heavy swell heaving into the harbour which as before stated is completely exposed to winds from this quarter.

Observations made here this year confirm those made in 1884, both as to latitude and longitude, and alter the position of the island by nearly the length of itself.

On leaving Marble Island, I intended to go north to Roes Welcome, and to have visited Chesterfield Inlet, but when clear of the land I found a heavy sea, and the compasses were working very badly, swinging through arcs of 80° or 90°, that they were for the time useless, and I had to keep out in the open and wait for clear weather.

The weather continued thick and dirty all day of the 24th, and as the time for taking up the more important work in Hudson's Straits was fast approaching, we bore up for Cape Southampton, though, as events shaped themselves, we were fated not to see it for several days.

August 25th. This morning was clear and fine, and observations for position were obtained, but shortly after noon dense fog set in, turning to rain, and by midnight or early morning of the 26th it was blowing a gale, with the ship lying to, under lower topsails and F. T. staysail; at 4 p.m., blowing very hard, took in the topsails and F. T. staysail and set the main spencer, bringing the ship close up to the wind under easy steam. This gale continued till 8 a.m. of the 27th, at which time the engines were started full speed and the course shaped for Cape Southampton as nearly as the carrying of fore and aft canvas would permit.

28th. This morning was beautifully fine, and at 11.30 a.m. anchored under the Cape and got sights for latitude and longitude. Whilst at anchor here current observations were taken, and the maximum velocity found to be $1\frac{1}{2}$ knots per hour; direction of the flood, west (true).

We left Cape Southampton in the afternoon and made a running survey of the coast, from the Cape to Cary's Swans Nest. I found the Cape considerably out of position, and extensive shoals running out from both it and the Nest.

29th August. The weather was again thick to-day, and by 5 p.m. a dense cloud of fog and smoke had enveloped the ship. This came down at first in showers, lasting fifteen or twenty minutes, and gave rise to very peculiar luminous effects; in the intervals between the showers the daylight was yellow and the water appeared of a pale greenish hue; at 6 p.m. it was so dark that lamps had to be lighted. The night which followed was one of intense darkness, such as I have never before witnessed, the hand held six inches from the face could not be seen, and men walked up against each other on the deck. The smell of smoke was as strong as if the fire had been close to us, and at Stupart's Bay, nearly 300 miles distant, Mr. Payne informs me that the rain water collected on this occasion was much discoloured, and when filtered through blotting paper left a very considerable deposit of dark coloured sediment.

With us at the ship the wind was blowing fresh all night, and we lay to on the starboard tack, allowing her to drift to the northward, but keeping the lead going the whole time. On the morning of the 30th some heavy showers of rain helped to clear the atmosphere, and shortly after daylight Nottingham Island was sighted. This enabled me to determine our position approximately and I at once headed the ship across the Straits for Digges Island. The weather continued thick and dirty all day, but at 6.40 p.m. we arrived safely in Port Laperriére, the barometer still falling rapidly and the wind increasing in force.

On the 31st August and the 1st and 2nd September, the gale continued. On the 31st and 1st it blew so hard that the boats could not work getting off stores, and on the 2nd the boats could only work ballast on the western side of the harbour. All hands were now employed in shifting coals from holds to bunkers, and in getting off ballast and generally preparing the ship for the rough weather of the autumn.

On the 3rd I sent away a party under Messrs. Tyrell and Skymer over to the mainland to finish some coast outlining there and to try and get some fresh venison from the Eskimo who are generally to be found there. The party returned on the 4th, having satisfactorily completed the work, though they had been unable to obtain any fresh meat.

September 5th and 6th. Another heavy gale with a sea heaving into the harbour that makes the ship roll heavily.

The house had now been taken down and brought on board, together with all stores and provisions which were unused, and as the weather continued very unsettled I hoisted the steam launch in on deck and secured it there.

Mr. Woodworth addressed me a letter stating that he had found his supply of provisions ample and of good quality. Inasmuch as during the winter of 1885-86, reports were circulated that the stations were insufficiently provisioned and coaled. I give below the list of fuel and provisions which we took on board for Mr. Woodworth's station, of the other stations, some of them returned more and some a little less.

List of articles received on board from Station No. 6, Mr. Woodworth:—

21	sacks coal, 180 lbs. each.	$\frac{1}{2}$	tub butter.
3	barrels pork.	6	cases kerosene.
4	$\frac{1}{2}$-barrels do	1	keg vinegar.
2	barrels beef.	15	lbs. evaporated onions.
$\frac{1}{4}$	barrel sugar.	10	do do corn.
$\frac{3}{4}$	do oatmeal.	$\frac{1}{2}$	qntl. codfish.
6	sacks flour.	$\frac{1}{2}$	bag rice.
1	do beans.	37	lbs. evaporated cabbage.
3	bags bread (No. 1 Pilot).	46	do ground coffee.
1	box soap.	1	box fluid beef.
1	do evaporated vegetables.	35	lbs. tea
2	boxes canned mutton.	3	boxes lime juice.
$1\frac{1}{2}$	do do beef.	8	cans peaches.
$\frac{1}{2}$	box do pears.	35	lbs. evaporated turnips.
1	do evaporated potatoes.	98	do do apples.
3	barrels No. 1 Pilot bread.	1	box canned pears.
$\frac{3}{4}$	barrel beans.	3	tins mustard.
$\frac{1}{2}$	do flour.	40	lbs. currants.
$\frac{1}{2}$	do syrup.	1	box cocoa.

The above list shows what was returned unused, and is the best possible answer to the statements which were made, that the stations were insufficiently supplied.

September 7th. At 5 p.m. left Port Laperrière for Nottingham Island, steaming dead slow. At 11 p.m. weather rather foggy; met a lot of loose ice, off the edge of which we lay till daylight.

September 8th. At daylight sighted Nottingham Island, and at 8 a.m. arrived in Port de Boucherville and anchored. All hands were immediately put to work getting off the stores and taking down the house, the whole work being completed and the ship at sea again at 6 p.m. the same evening.

We found Mr. McKenzie and his two assistants, Messrs. Gooley and Fleming, in excellent health; they had an ample supply of provisions to have lasted through another winter, and for fuel had thirty-five sacks of coal, besides some two cords of wood. Mr. McKenzie, in his letter, says in regard to the temperature maintained in his station-house:—"A temperature of between 50° and 60° could be kept up when the temperature outside was 45° below zero (our coldest), with quite a light fire."

At the time of our arrival Mr. McKenzie and his assistants were engaged in collecting and drying turf for fuel in anticipation of spending a second winter there. This turf dried, and burned with a little seal oil or fat of any kind, makes an excellent fire.

Mr. McKenzie and his party had been very successful hunters, and during their entire stay on the island they had rarely been out of fresh meat—deer, ptarmigan, ducks and geese, having been shot in considerable numbers.

About Nottingham Island there was a good deal of loose ice, which, though nothing to seriously affect navigation, was heavy old ice, and was undoubtedly the advance guard of the pack of old ice coming down from the north, but appearing somewhat earlier than in 1885.

September 9th. After leaving Nottingham Island the wind again began to freshen from the eastward, with a rapidly falling barometer; it blew fresh all day of the 9th, and before midnight it was blowing a whole gale. This continued all day of the 10th and up to the evening of the 11th, the weather being thick with occasional snow showers. At 10 p.m. of the 11th the wind died down very suddenly, and at 9 a.m. of Sunday, the 12th, we arrived in Ashe Inlet.

At this place I had a large beacon erected on the top of a high bluff close to the shore. This we named Tyrrell's Bluff and Beacon. It is an excellent mark, as both from east and west the hill top shows against the sky line, and the beacon stands out in bold relief.

September 13th. All hands employed in getting off the stores, unused provisions, &c.

14th, 15th. Dense fog in the Straits, and as our next port was Stupart's Bay, on the south side, it was useless to go out till there was a reasonable certainty of having clear weather to make the land over there.

September 16th. This morning the weather being clear left Ashe Inlet at 5 a.m. and steamed across the Straits, arrived and anchored in Stupart's Bay at 3 p.m.

We found Mr. Payne and his two assistants, Messrs. Paul and Boutellier, in excellent health. They had experienced no serious difficulty in dealing with the Eskimo, and had scarcely touched their salt provisions, so plentiful had seals and game of various kinds been with them. Shortly before the arrival of the "Alert" Mr. Payne had himself shot some seventy geese in one day.

Besides carrying on the regular series of meteorological and tidal observations, as well as those required to be made in regard to the movements of the sea. Mr. Payne has made very careful observations of the flora and fauna. He has complete collections of plants with dates of budding, leafing, flowering, seeding, and withering, he has also carefully preserved specimens of marine fauna in alcohol. Mr. Payne reported that salmon and trout had been very plentiful and he sent on board for our use a barrel of salted salmon, which, with the geese he had shot, made a very pleasant and wholesome change of diet for us.

17th, 18th, 19th. The wind blowing a fresh gale throughout, causing such a heavy surf that it was impossible to get off any of the stores.

September 20th. Sent Mr. Tyrrell down in one of the whale boats to make a track survey of the lower part of the Sound.

September 21st. Mr. Payne having reported to me that he had seen at a spot some ten miles distant four small cast iron cannon and a large mooring anchor, I sent Capt. Barrie down with a boat's crew to examine and if possible to bring away the guns.

Capt. Barrie reported that there was a large stone beacon on one of the hills close by, and that the guns and anchor were up above high water mark and had no appearance of having been cast up by a wreck. There were no signs of any building and the small gun, which Capt. Barrie brought back must have been of great age as the year marks are completely eaten away by rust and the iron deeply pitted and this although the guns were lying well up clear of any possible contact with the sea water.

Mr. Tyrrell reported that some of the small islands in this Bay were full of magnetite; at one place on a high bluff in rear of where the guns were found, the compass was utterly useless.

Towards the evening of this day (21st) the weather again became thick and rain commenced with increasing winds.

September 22nd. I had intended going to sea this morning at daylight, but before then it was blowing a strong gale, accompanied by snow at intervals, and continued to do so up to 10 p.m. of the 24th.

During our stay here I had secured fairly good observations for position. These place the observing station, which is 300 feet north (mag.) from the weed-covered landing place at high water, about the centre of the sandy beach, in

Latitude, approximate, 61° 34′ 48″ N.
Longitude do 71° 31′ 30″ W.

On the morning of the 25th, left Stupart's Bay for Port Burwell, and made a running survey of the coast from Neptune Head to Long Island.

This gives approximately the true position, in latitude and longitude, of the coast line, but owing to the distance which the ship was from the shore it was impossible to work in any details. The coast line east of Prince of Wales Sound is laid down on the Admiralty Charts much further north than it really is.

After leaving Long Island I steered for a point some little distance to the north of the position of Green Island, as laid down by Captain Parry. On the following morning at daylight I was abreast of the position, and but little to the north of it.

The morning was clear and bright, and no sign of land was to be seen from the mast-head.

I got good sights for position at 9 a.m. and noon, and consequently cannot have been much out of the position laid down. I am therefore forced to conclude that Green Island, as laid down by Parry, has no existence, especially as he marks it (high). Moreover, I did not see it on the passage in, though the ship passed within ten miles of it. on a fine clear morning. I have therefore taken it off the chart.

Sunday, 26th. Arrived and anchored in Port Burwell, at 4 p.m. We here found Mr. Shaw suffering from a severe attack of scurvy. He was very low, fainting at once if he sat up for more than three or four minutes, and this fainting occurred with such frequency that I greatly feared for his life.

Soon after he came on board a marked improvement was visible in his condition, and by the time we arrived in Halifax he had nearly recovered.

It is needless to say that for some time prior to the arrival of the ship Mr. Shaw had been completely incapacitated for duty, but I am happy to be able to state that the observations were very satisfactorily taken by his assistants, Telesphore and Jean Mercier.

September 27th. Employed in taking down the house and receiving on board all the unexpended stores and provisions.

The Messrs. Mercier had killed and dried some codfish, which though small were very fine and were well "made." They reported that the codfish had struck in in considerable numbers, and that if they had been able to afford the time they could have captured many more.

Mr. Shaw reported to me an incident of Eskimo administration of justice, which was, to put it mildly, somewhat summary in its procedure.

There lived between the Cape and Aulalsivick, a good Eskimo hunter, whose native name is not given, but who was christened by our station men "Old Wicked." He was a passionate man and was continually threatening to do some bodily harm to the other more peaceably inclined natives. Finding himself so successful with the natives, he, after persuading one or two others to accompany him, came to the station and demanded food and the big station boat, but was somewhat surprised to be seized by the neck and kicked out of the house. He then altered his tactics and became very subservient to our people, but his arrogance and petty annoyances to the other natives became at length unbearable. It appears that these unfortunates held a meeting and decided that "Old Wicked" was a public nuisance which must be abated, and they therefore decreed that he should be shot, and shot he was accordingly one afternoon when he was busily engaged in repairing the ravages which a storm had made in his "igloo" or snow house. The executioner shot him in the back, killing him instantly. The murderer or executioner (one hardly knows to which title he is the more justly entitled) then takes both of "Old Wicked's" wives and all his children and agrees to keep them. The last act in this drama is when the now muchly married executioner reports the whole case to the Hudson's Bay officer at Nachvak, merely mentioning that he will keep the women and children so that they shall be no burden on the company.

September 28th. Blowing a fresh easterly gale. All stores and lumber are now on board and we only wait for the weather to clear up before going to sea.

September 29th. Left Port Burwell at 9.30 a.m. and passing through Gray Strait made running survey of the Button's Islands and the Cape Chudleigh coast, taking soundings regularly every half hour, and although on the passage to Nachvak Bay we were at one time more than 30 miles off the coast, at no time did the water deepen to as much as 100 fathoms.

This showed that the bank which we discovered here on 8th July extends off Eclipse Harbour to nearly 30 miles off shore. A bank situated as this one is, on the south side of a deep water channel, is of the greatest value to ships making the Straits in thick weather. The bank can be made and then steering north, true, a sufficient distance to clear the Button's Islands steam in fearlessly about the parallel of 61° N.

Considering the importance of this discovery, I should have liked to have been able to outline the bank, but fears for Mr. Shaw's health compelled me to push for home, where he would have the advantage of proper medical advice and attendance.

September 30th. Arrived in Nachvak and went up the Inlet to the Hudson's Bay Company's post. I arranged with Mr. Ford, the agent of the company, for the sale of the station house left here; having completed these arrangements, we left the post shortly after noon and anchored in Skynner's Cove for the night.

I did not at first shape course directly down the coast, but steered east until we reached a depth of 100 fathoms, at which time we were more than 70 miles off the land.

The remainder of the voyage was uneventful, we had a fine run down the Labrador coast and got into the Straits of Belle Isle early in the morning of 5th Oct.

When off Forteau Point on this afternoon, the wind, which was blowing from S.W., had now increased to a gale, against which we made little or no headway. I therefore ran into Forteau Bay for shelter, anchoring there about 6 p.m. The gale continued all the next day, but at 5 p.m. it shifted to N.W., when I at once put to sea, and passing Bay of Islands about noon on the 7th, reached Meat Cove and made our number on the 8th, then passing down the west side of Cape Breton Island and through the Gut of Canso, arrived in Halifax and made fast to the Departmental Wharf at 4 p.m. of Sunday, the 10th October.

All hands were at once discharged, and only such men re-engaged, at port wages, as were necessary for the performance of the work in hand.

ICE OBSERVATIONS.

ICE MET WITH ON THE VOYAGE OF THE "ALERT," 1886.

The first field ice made this year was on the 2nd of July, about 60 miles south of Cape Mugford. It was heavy, but much scattered, and from this point to Cape Chidley the ice lined the coast, being tight for about 15 miles off shore, and beyond that, slack, for about 10 miles more. After getting round the Buttons, dense fog set in, and the ship was beset, finally drifting about 30 miles to the south before the weather cleared on the 8th; the ship was only beset at times, the ice running abroad frequently, so that progress could have been made had the weather been clear.

This ice was heavy, old ice, much broken up, the largest piece to which the ship was made fast was about 300 yards by 200 yards; at the time this was measured the fog was so dense that the men engaged in the work were out of sight from the ship, and we had to keep the whistle blowing to guide them back.

On the 9th, we found that the pack of ice which extended to the east of Cape Chidley shore about 18 miles, ran 14 miles north of the Buttons, and all this day and the 10th heavy ice lay to the south of the ship.

On July 11th found that the ice trended to the north, following the lay of the coast, leaving only a narrow lead of open water along under the shore from Ashe Inlet westward. From this station to the western end of the Straits, the ice was one continuous pack, with little water holes here and there showing up as we worked through. At the western end of the Straits the ice was heavier and in larger sheets than that off Ashe Inlet, some of the floe pieces were upwards of a mile in length and formed of hummocky old ice, now worn a dirty brown colour. Many of the smaller pans assume a crater-like shape, a pool of water forming in the centre, and gradually rotting through in this way.

To those who have never experienced it, the uncertainty of ice navigation is something almost incredible. At one time the ship may be fast, and the ice all tight run together; so that, even from the mast-head, no water at all can be seen, and you are firmly convinced that the ship will stay where she is till the ice melts: some change of tide or wind occurs; and in less than half an hour, the ship is steaming full speed, only hitting once in a while as she twists about in the spreading pack, and

per contra sometimes, when all things look well, the pack closes, and there is nothing to be done but wait patiently till it shall, as suddenly, open again.

From the 11th to the 19th July the ice covered the Straits from " Emma Island " to Cape Digges, and through this 200 miles we worked, every time the ice opened gaining something, if only half a mile. Much of this ice was heavy old ice, and of such a nature that no ordinary steamer which could be used as a freight-carrier, even if strengthened and sheathed for ice, could, in my opinion, have passed through at this time without injury.

On leaving harbour of Digges Island on the morning of the 25th the ship was again beset and only got clear on the following morning. After this date we met no ice which would in any way have interfered with navigation.

Captain Guy, of the steamer " Arctic," one of the most powerful of the Dundee whaling fleet, has kindly furnished me with notes, from his experience in Hudson's Straits this year, and the following is taken from his communication :—

"The 'Arctic' left St. John's, Nfld., on 16th May, and proceeded northwards, making the ice at the south side of Cumberland Gulf on 25th May, intending to go into the gulf; the ship was, however, beset about ten miles from Monumental Island, wind being from the eastward, and drove from there round the south side of Resolution Island into Hudson's Straits, still fast in the ice, and only got free at the Lower Savage Islands on 2nd June."

Capt. Guy found the S.W. ice extending to the east of Resolution Island and Cape Chidley, about 40 to 50 miles tight, with from 10 to 20 miles of slack beyond that.

From the Lower Savage Islands to Ashe Inlet, Capt. Guy says, they had no trouble, but the voyage occupied from 2nd to 5th June, and the distance is only 150 miles; we must admit that the progress of the " Arctic " was not very rapid.

After leaving Ashe Inlet, Capt Guy states that he found the ice much heavier, being now from 15 to 20 feet thick; proceeding north-westward, he got up into Fox Channel as far as Cape Queen; here, however, he found an impassable barrier of ice, and tried to cross the channel to the westward; this was also impossible, and so the " Arctic " headed south, watching for a slack place to enter the barrier of ice. From the 20th June to the 25th July, the " Arctic " was steaming between Cape Queen and Charles Island, trying to get into Hudson's Straits, and only reached the western end of the Straits on 26th July, or five days after the " Alert " had got through and into harbour at Port Laperrière.

Capt. Guy ascribes the fixed condition of the ice to the fact that there was no southerly wind during the whole time he was trying to get through, but our records at Port Laperrière show that winds between S.E. and S.W. prevailed on twenty-one days out of the thirty-five; the winds were, however, light, and the breadth of the pack so considerable, that winds, unless long continued, would have but little effect, besides which, Capt. Guy was trying to work through too far to the north. Capt. Guy, on his voyage home in October, tried to pass up through Fisher Strait, but found it full of heavy old ice, into which he would not put his ship, but, though he was half way through the Strait, turned and, passing south of both Southampton and Mansfield Island, met loose ice again off Cape Digges, after which, with the exception of the East Greenland pack, which was sighted off Cape Farewell, no more ice was seen on the voyage.

STATION No. 1.

PORT BURWELL.

ICE OBSERVATIONS.

October, 1885.

No field ice reported here in this month.

November, 1885.

20th. First field ice seen.

21st, 22nd. Light field ice as far out as can be seen from Beacon Hill.
23rd, 24th, 25th. Ice extends as far as can be seen.
30th. Solid field of ice extends to the horizon.

December, 1885.

No report made on the ice in this month.

January, 1886.

No report on ice.

February, 1886.

26th. From the Beacon Hill saw open water about two miles from the shore, extending from N. to S.W.; atmosphere hazy; could not see how far the open water extended.

27th. Harbour ice 3 feet 7½ inches thick.

March, 1886.

2nd. Clear water extends from S. to S.W.; in a north-west direction loose field ice as far as can be seen with the telescope.

4th. Clear water to S.W.; field ice from N.W. to N. as far as can be seen.

7th. No open water visible.

April, 1886.

1st. Harbour ice now 3 feet 9 inches thick; has increased only 1½ inches in the last month.

3rd. Open water for about 3 miles from shore; field ice beyond.

5th. An iceberg visible about 5 miles off, bearing W.S.W. (true); it is moving out of the Straits.

20th. A little open water to the S.W. some distance off shore.

25th. A sheet of clear water near the shore; ice beyond extends from S.W. to N.W.; in the N.W. a little open water shows.

26th. A little field ice visible about west; elsewhere clear water to the horizon.

27th. Open water near shore; field ice beyond.

28th. Loose field ice in S.W. and west; ice is closely packed north of this bearing.

30th. Ice tightly packed, but much broken.

May, 1886.

1st. Ice in the harbour is 3 feet 10½ inches thick.

16th. Open water shows to S.W., and a little also shows here and there, from W. to N.

23rd. A large sheet of water shows to the south.

24th. Open water close to shore; weather hazy; could not see out far.

25th. Open water to the S.W. as far as the horizon; air very clear; can also see a large sheet of open water from S.W. to N.W.; ice beyond.

26th. Open water close to the shore; ice from S.W. to N.W.

29th. Open water same direction as yesterday; ice beyond seems much broken up.

30th. Ice tightly packed as far out as we can see; a small lake of open water in S.W. near the shore.

31st. Small lakes of open water show through the pack in every direction.

June, 1886.

2nd. Lanes of open water in S.W. close to the shore; field ice beyond seems loose.

3rd. Ice same as yesterday.

5th. Large sheet of open water in S.W.

6th. Ice tightly packed.

7th. Ice tightly packed but much broken; small streaks of open water.

8th. Streaks of open water to the south, and in the S.W. field ice is closely packed as far as be seen.

9th. Field ice to S.W.

10th. Open water extends out for two miles.

11th. Same as yesterday.

13th. Open water in every direction; a little loose ice showing in the offing.

14th. Foggy; no ice visible.

16th. Open water in every direction; a little loose ice in the offing.

20th. Ice tight along the shore and extends to the horizon. Water sky to the N.W.

21st. Heavy close ice in every direction.

22nd, 23rd, 24th, 25th, 26th, 27th. Same as 21st.

28th, 29th. Foggy, open water shows near the shore.

30th. Ice very much broken up, with open water showing in considerable quantities.

July, 1886.

1st. Ice continues about the same.

2nd. Ice loose close to the shore, but seems tighter further out.

3rd. Ice loose to southward, but now closely packed in N.W. Lakes of open water show everywhere.

4th. Ice same as yesterday.

5th. Foggy.

6th. Fog hanging off outside.

7th. Snowing nearly all day.

8th, 9th, 10th, 11th. Open water close to shore. Field ice beyond, most closely packed from W. to N. but lanes of open water show in places.

12th, 13th. Open water in S.W., but from west northwards closely packed field ice. Eighteen icebergs are in sight to-day.

14th. Harbour ice is breaking up to-day, outside the ice is looser.

15th, 16th, 17th. Open water near shore; field ice in the offing.

18th. A little open water shows to south; elsewhere field ice, which looks very solid though having some water holes in it.

19th. The harbour ice having gone, the harbour is now full of heavy field ice.

20th. A little ice near shore, but pretty clear as far as we can see through the haze.

21st. Clear water in the south, but from S.W. to north heavy field ice; harbour is still full of ice.

22nd. No ice visible.

23rd. Some field ice some distance off to N.W.

24th, 25th. Open water in south; field ice from west to north.

26th, 27th, 28th, 29th. A good deal of ice shows in different directions, but it is loose, and the area of clear water showing is very considerable.

30th, 31st. No ice in sight. Heavy sea outside.

August, 1886.

1st. No ice in sight.

2nd. Some scattered field ice shows to the northward.

3rd. No ice in sight.

4th. A little ice shows to the westward.

5th, 6th, 7th, 8th. A little ice shows to N. W.; clear water in every other direction.

9th. Foggy.

10th. Fog continues, but loose field ice is near the shore.

11th. Small scattered ice extends from S. W. to N. W.

12th. Clear water to the south; from S. W. to N. loose field ice, but open water shows beyond the ice in many places.

13th, 14th. Field ice from S. W. to N. W, a long distance off shore; clear water in all other directions.

15th, 16th, 17th, 18th, 19th. No ice in sight.

20th. A little ice close to the shore, and some came into the harbour to-day.

21st. No ice in sight, nor was any seen after this date, up to the time the station was relieved.

STATION No. 3.

ASHE INLET.

ICE RECORD.

September, 1885.

20th. No field ice in sight. Ice on ponds one inch thick. Eleven icebergs in sight. No field ice seen during the month, but numerous icebergs passing westward.

October, 1885.

26th. First field ice observed from Lookout Hill, lying on the horizon to the westward. Ice forming in the harbour and on the rocks along the shore.

27th. No ice visible, but a white line shows along the western horizon.

28th, 29th, 30th, 31st. No field ice visible, but a number of icebergs seem to have taken the ground on the shoals.

November, 1885.

1st. No ice in sight except the bergs.

3rd. The Inlet is nearly covered with newly formed ice about three-quarters of an inch thick.

th. Ice two inches thick in the harbour.

8th. Field ice is visible to the southward, but clear water between the shore and pack, at least twelve miles.

9th. Foggy.

13th. No trace of field ice.

15th. Large field of young ice extending from north to west, and 5 to 10 miles off shore.

16th, 17th, 18th, 19th, 20th. Straits nearly covered with young ice.

21st. Most of the ice has been driven off the shore by the wind.

22nd. Young ice still about. Harbour frozen over.

23rd. Harbour ice broke up and passed out of the Inlet.

29th. Straits frozen as far as visible, some three miles. Dense fog beyond, probably over open water.

30th. Snowing and drifting, cannot see out into the Straits.

December, 1885.

1st. Ice is five or six inches thick on the Inlet; snow obscures the view of the Straits.

2nd, 3rd, 4th, 5th. Snowing and drifting; Straits completely hidden.

6th. Straits frozen solid for eight or ten miles; beyond that loose ice shows.

7th, 8th. Straits obscured by snow drifting.

9th. Ice covering straits as far as visible.

10th, 11th, 12th, 13th. Straits frozen over as far as visible from look out.

14th. Examined the straits from summit of "Tyrell's bluff," 450 feet above M.S.L. Ice covers the Straits in every direction, but is somewhat broken.

22nd. Ice visible in every direction, but much broken.
23rd. Snowing; Straits obscured.
24th to 31st. Straits generally obscured, but when opportunity offered and observation made, no change was apparent.

January, 1886.

1st to 20th. No change observed in the condition of the ice.
21st. Ice much broken and running.
22nd, 23rd, 24th. Straits obscured.
25th. Eskimo state, that the White Straits, to the north of this island are frozen over solid, and the ice is stationary.
26th, 27th, 28th, 29th, 30th, 31st. No change observable in the condition of he ice in the Straits.

February, 1886.

1st, 2nd, 3rd. Weather thick, no change in the ice so far as can be seen.
4th. Ice much broken.
5th, 6th. Ice much broken and masses of vapour rise from the water.
7th to 15th. No change in the ice.
16th. Ice is still much broken, but now very compact.
17th to 28th. Straits much obscured; no change in the ice reported.

March, 1886.

1st. Open water as far as visible to south-east; to the south and west the ice is only two or three miles from shore.
6th. Ice very loose and running; water horizon in S.E. and S.
7th, 8th. Foggy.
9th. Ice still loose and moving freely with the tide.
10th. Much open water shows amongst the ice.
12th, 13th, 14th, 15th. Misty over Straits; snow drifting.
18th; 19th, 20th. Ice much broken up and swinging with the tide.
21st. Water appears to be on the horizon, to the S.W.
23rd. Foggy.
24th. Ice loose, moving with the tide.
25th, 26th. Snow drifting all day.
27th. Ice loose, much open water shows.
28th. The heavy ice has been driven off shore several miles.
29th. Ice still off shore. New ice forming on the open water.
30th, 31st. Snow drifting, Straits cannot be seen.

April, 1886.

1st, 2nd. Ice tight in every direction.
3rd. Ice loosened a little to-day.
4th. Open water shows.
5th, 6th. Ice loose and open.
7th, 8th. Ice loose, swinging with the tide.
9th, 10th, 11th. Snowing and drifting; Straits obscured.
12th. Ice closed up tight this afternoon, opening again in the evening.
13th. Ice tight.
14th. Ice loose off shore.
15th, 16th. Snowing and drifting.
18th, 19th. A considerable extent of open water off shore.
20th. Ice has come in shore again, tight.
21st, 22nd, 23rd. Ice slack.

24th, 25th, 26th. Open water extends several miles off shore; ice is barely visible from the station.

27th. Ice driven in tight on the shore.

2·th. Ice slack.

29th, 30th. Open water extends for miles off shore.

May, 1886.

1st. Ice well off the shore.

2nd. Ice in shore again, but long leads of open water show in places.

3rd. Ice close in shore and tight to the westward, clear water as far as can be seen to the eastward.

5th. Ice slack, but near the shore.

6th. Snow drifting, Straits obscured.

7th. Open water extends for several miles.

8th, 9th, 10th, 11th, 12th, 13th. Ice tight and close in on the shore.

14th. Snow drifting, cannot see the Straits.

16th. Ice tight, no water visible in any direction.

17th, 18th. Mist and snow obstruct our view of the Straits.

19th. Ice slack.

20th. Ice tight in the morning, slackening again at night.

21st, 22nd, 23rd. Ice tight in every direction.

24th. Snowing; ice slackened off in the evening.

25th, 26th, 27th, 28th. Ice tight; no water visible.

29th, 30th. Mist and rain obscure the view of the Straits.

31st. Ice the same as formerly as far as can be seen.

June, 1886.

1st, 2nd. Weather misty. No change in the ice as far as can be seen.

3rd. Ice close on the shore, not moving perceptibly.

4th, 5th. Open water along shore. At 3 p.m. of the 5th the ice was several miles off, and on the 6th steamship "Arctic," Captain Guy, made fast at the entrance of the harbour, the harbour ice being still solid.

7th. Foggy. "Arctic" left at 8 a.m. Ice again in on the shore, but quite slack.

8th, 9th, 10th, 11th. Ice slack and swinging off and on the shore. Plenty of open water showing.

12th, 13th, 14th. No ice visible to the eastward.

15th. Foggy.

16th. Plenty of open water showing.

17th. Ice close in on shore, slacking off again at night.

18th. Misty, view of Straits obscured.

19th, 20th. No ice to the eastward, but to south and west the pack is from five to ten miles off shore.

21st, 22nd. Still open water to the eastward.

23rd. Very little ice visible.

24th. No change in the appearance of the ice in the Straits. In the harbour the ice has melted away a great deal, and is quite through in some places.

25th. A little scattered ice in the east. Ice in harbour rapidly breaking up.

26th. Dense fog.

27th, 28th, 29th. No ice to the eastward. The body of the pack lies about eight miles off shore, to the S.W., gradually receding.

30th. Harbour ice generally breaking up.

July, 1886.

1st. Foggy.

2nd. Ice from eight to ten miles off shore to the S.W. About three-fourths of the harbour ice is broken up.

3rd. Harbour ice completely broken up. Ice closing in on the shore.

4th. Harbour filled with heavy pack ice. The whole body of the ice is tight in on the shore.

5th, 6th. Dense fog.

8th. Open water and slack ice to the east. To the west the ice is close in.

9th. Plenty of open water, with scattered ice only showing.

10th. Scattered ice about.

11th. "Alert" arrived at 4.50 a.m., sailed again at 6 a.m. The ice apparently about eight miles off shore.

12th. Plenty of water along the shore. The body of the ice a little closer than yesterday.

13th. Foggy to the westward. No ice showing to the eastward.

14th. Foggy.

15th. Still foggy, but the ice has come in on the shore again.

16th. A little scattered ice along the shore, is all that is in sight.

19th. Some loose ice coming into the harbour, none visible outside.

20th. Ice shows to the west in the forenoon; a heavy swell set in from the south in the afternoon; fog shut down thick.

21st. Ice again closing in rapidly on the shore. No water to be seen in any direction.

22nd. Ice still tight.

23rd. Ice slack outside.

24th. Fog very dense.

25th. Ice close as far as the Straits are visible.

26th, 27th, 28th. Dense fog.

29th. Ice looser and moving, but no water showing.

30th, 31st. Ice loose again.

August, 1886.

1st, 2nd. Ice tight, till 11 p.m of the 2nd, when water begins to make along the shore.

4th. Ice loose and running.

5th. Plenty of open water shows.

6th. Loose ice outside.

9th, 10th, 11th, 12th. Dense fog over the Straits.

13th. A very little loose ice shows.

14th. A heavy swell heaving into the harbour.

16th. No field ice in sight; eight icebergs can be seen from the look-out.

17th, 18th. Foggy. No field ice seen after this date.

STUPART'S BAY.

ICE RECORD.

From 22nd August to 28th September there was no ice seen.

September 28th. Ice is forming at mouths of small streams, and after breaking up carries with it far to sea quantities of seaweed, shells and gravels which adhere to it.

October.

17th. No change has taken place since 28th September. Large masses of hard packed drifted snow on the shores are continually being carried off by receding tides.

18th to 23rd. Ice continues to break off the shores and drift away, carrying seaweed and small stones

23rd. A small iceberg was seen to-day.

26th. During last night a thin film of ice formed on the Bay. A ridge of snow and ice 2 feet high has formed along the shore, over which the increasing tides rise. A long line of field ice can be seen lying between north and south near the horizon.

27th. Field ice seen yesterday appears to be approaching in spite of a contrary wind. Ice again formed over the Bay, and is breaking up and piling, forming quite thick ridges.

29th. All ice in the bay has broken into small pieces, which at low tide rest upon the boulders, to which much of it adheres, the tide rising over it. Field ice appears stationary.

30th. The wind blowing freshly from the north-west during the night; all the ice that was in this and neighbouring bays, has drifted to sea.

November, 1886.

1st. The field ice now extends all along the horizon, and appears to be about 10 miles from shore to the north-eastward.

3rd. To-day a portion of the field ice moved directly southward, and is gradually closing in. The Bay is open.

4th. As fast as ice forms in the bays it drifts to sea, and now covers the water between the land and the field ice which is quickly approaching.

6th. The field ice, though loose, is now close upon the land, and has filled most of the larger bays, driving and piling the thin native ice in front of it.

7th. At the time of high tide large masses of ice over which the water rises occasionally come to the surface carrying immense stones with them. These pieces of ice with their freight of stones often rest upon the ice still adhering to the bottom as the tide falls. Field ice is more open.

10th. The prevailing south-westerly wind has driven the ice out of all bays excepting the smaller ones, and large patches of open water can be seen throughout the field ice.

11th. Fog and mist covered the Straits to-day.

12th. All the ice in the bay facing the station drifted to sea and now large stretches of water can be seen in every direction.

13th. At 8 a.m. there was a great deal of open water to be seen; towards afternoon, however, an unbroken mass of field ice could be seen quickly appoaching from the northward.

14th. The Strait is now packed with heavy field ice throughout, the smaller bays only being open.

15th, 16th. Field ice is more open and long narrow leads of water can be seen.

18th. As far as can be seen the ice is very loose. A large berg can be seen to the E.S.E.

19th. All the ice has drifted out of the bays excepting isolated pieces, many of which measure 16 feet in thickness.

20th. During the night all open water between the ice floes was frozen and now only ice can be seen.

21st, 22nd. Ice in the bays is firmer. Long lanes of open water can be seen throughout the pack.

23rd. To the north east the field ice appears to be tighly packed, whilst from that point along the shore to the south-east it has moved several miles from land.

25th. Ice is tightly packed to the north eastward and much more to the south-eastward. Several bergs are seen to the eastward.

26th. All bays are again open, and the prevailing strong north-westerly wind has driven all ice, some miles from the shore.

30th. No perceptible change has taken place during the past few days, there being a wide belt of open water round the land; now, however the ice appears to be closing in again.

December, 1885.

1st, 2nd, 3rd. Owing to snow falling and foggy weather no observation of the strait clould be made.

4th. The ice is very open throughout.

6th. During the night the ice in the bay, which was 10 inches in thickness, again broke up and by the afternoon the bay was again free of ice, there also being a wide belt of open water, round the coast.

7th. Again the ice has returned and now this and neighbouring bays are filled with heavy ice, some of which is 15 feet in thickness.

8th. The Strait and bays are now tightly packed with ice, there only being some small pieces of open water here and there.

9th. Fog completely hides the Strait.

11th. There is a wide belt of water round the shore, and the ice appears more open throughout.

12th to 17th. Little change has taken place. No open water can now be seen.

18th. A decided movement has taken place in the ice to-day, the prevailing south-westerly wind driving it off the shore, while to the eastward and south-eastward large stretches of open water can be seen.

21st. During the past few days mist has hung over the Strait, so that it has been impossible to see far beyond the shore. The ice, though opening occasionally, is compact throughout.

22nd. A good view of the Strait was obtained to-day; ice is compact throughout.

24th. Small pieces of open water can be seen throughout the pack, especially so near the horizon, where leads, some miles in extent, can be seen.

28th. Open water seen during the past few days is now frozen.

29th, 30th. Misty weather has prevented any observation of the Strait being made.

January, 1886.

2nd. During the morning the ice was still compact, but in the afternoon a number of small pieces of water could be seen throughout the pack.

4th. There is now a wide belt of open water round the shore, beyond this it is too misty to see.

9th. Owing to foggy weather, it has been impossible to see beyond the shore during the past few days. To-day large stretches of open water can be seen, and to the east and south-east all the ice has moved some distance from the shore.

12th. Until this afternoon, owing to dense mist hanging over the Strait, it has been impossible to see any distance beyond the shore. A large area of open water could be seen to the south-east.

13th and 14th. A few small pieces of open water can be seen.

15th. Open water from north to east-north-east as far as can be seen, also large stretches of water in east-south-east.

19th. Since the 15th inst., vapour rising from water near the shore has completely hidden the Strait. To-day the ice is comparatively compact throughout.

20th. Snow falling; cannot see beyond the shore.

22nd. The horizon is misty. The ice is very much broken throughout the pack, and is all moving to the eastward.

28th. It has been impossible to see beyond the shore since 22nd instant owing to fog. Where rough ice was a few days ago, is now smooth new ice, showing the former must have broken up and drifted out.

29th. Small pieces of water may be seen throughout the pack, and all ice is moving north-eastward.

30th, 31st. Misty; no observation of the Strait.

February, 1886.

1st. A good view of the Strait was obtained to-day. A few small patches of water can be seen to the north-east.

2nd, 3rd. Misty; cannot see beyond the shore.

4th. There are still a few patches of water to be seen to the eastward.

5th. There is a large lake of water in the south-east, and some smaller ones to the eastward. All ice is moving eastward.

9th. No change has taken place during the past few days. The ice is now compact throughout.

10th. At 2 p.m. some large pieces of water were to be seen to the south-eastward, and all the ice was moving slowly eastward.

11th. The ice continued to open and close at short intervals of time during the day.

12th. At 2 p.m. there was open water along the shore from N.E. to E., and all ice was moving slowly eastward.

16th. Since 12th instant it has been impossible to see the Strait owing to misty weather and snow falling. To-day the weather being clearer, it was found all the ice had drifted about ten miles from the shore, and now new ice is forming on the comparatively calm water.

17th. All open water seen yesterday is now frozen, and in places is breaking up and piling as it drifts to the eastward.

18th. All the newly formed ice within a few miles of the above is much broken, and a great deal of water can be seen.

21st. A bank of fog has continued to hang over the Strait for several days, and it has been impossible to see far from the shore. There is now a wide belt of water all round the shore.

22nd. Fog continues. Can see about ten miles from shore. Large stretches of open water can be seen in all directions.

23rd to 28th. Misty weather has continued so that it has been impossible to see further than a few miles from the shore. The ice continues much broken, and there are large pieces of water to be seen.

March, 1886.

2nd. The ice is compact throughout, and there was no perceptible movement in it at 2 p.m.

3rd. Can only see about three miles from the shore. The ice appears to be breaking up to the eastward.

4th. The ice is generally compact, excepting near the shore, where there is some water.

5th. The horizon is clear, at 2 p.m. all ice was loose and much broken, and there is a belt of water all round the shore.

8th. Since the 5th instant it has been impossible to see far from shore owing to fog. To-day the ice is compact throughout, excepting near the shore, where there is a little open water. At 2 p.m. is moving eastward.

9th. Ice is compact, and at 2 p.m. it was all moving eastward.

11th. Ice continues in the same condition.

13th. Ice is much broken and more open water can be seen than usual. At 2 p.m. all ice was moving northward.

14th. Extensive patches of water can be seen in all directions.

15th to 18th. Ice in same condition as on the 14th instant.

18th. Only a very few spots of open water can now be seen.

19th, 10 a.m. A great deal of open water can be seen from north to east. All ice appears loose, and is moving east.

20th. Owing to fog, can only see about ten miles from the shore. Ice is compact to the northward while to the eastward there is open water as far as can be seen.

21st. The ice to the eastward has again closed in but is loose, excepting to the northward where it remains compact.

23rd. Ice remains in about the same condition as on 21st inst.

24th. As far as can be seen there is a great deal of open water, and at 10 a.m. and 2 p.m. all ice was moving westward.

28th. Stormy weather and fog have prevented any observation of the Strait. To-day the ice is compact throughout.

30th. A wide lead extends from N. to N.E., also some water to the south-eastward.

31st. The ice is now much looser in every direction, and leads of open water can be seen throughout the pack.

April, 1886.

1st. No change has taken place in the condition of the ice.

2nd. Snow drifting, cannot see beyond the shore.

3rd. The ice is compact throughout excepting near the shore where there is a little open water.

4th. There is now a great deal of open water near the shore, while some distance beyond the ice is compact.

9th. No perceptible change has taken place since 4th inst.

10th. Only a narrow belt of water can be seen round the shore, and at 2 p.m. all ice was moving eastward.

13th. No change has taken place since 10th inst.

14th. The ice is now compact throughout.

16th. No change during the past two days.

17th. Since yesterday a great change has taken place in the condition of the ice which is very loose and quite navigable, excepting near the horizon where it is rather more compact.

25th. The ice has continued loose and quite navigable since 17th inst., and long leads of water could be seen.

26th. Again the ice has closed and now only a little water can be seen near the shore.

27th. Not much change has taken place since yesterday, the ice remaining generally compact, but occasionally opening here and there, as it is affected by a change of tide.

28th. The ice appears loose near the shore, and compact beyond.

30th. Snow falling and drifting, completely obstructed the view of the Strait.

May, 1886.

1st. The ice is very compact, and shows little sign of breaking up. As far as can be seen it is now an irregular mass of small pans, quite unlike that seen in the earlier part of the winter.

3rd. Not much change has taken place until this afternoon, when all the ice became much looser.

4th to 7th. The ice continues to open and close alternately every a few hours as it is affected by the tides, and the rapid movement along the shore, tends to show there is more room to move than usual.

8th. All the ice continues loose, and all that ice held between the shore and outlying reefs, which has remained firm throughout the winter, is now cracking in many places. Accumulated snow and ice of the winter now forms a cliff, in many places 30 feet in height; large portions of this now occasionally break off and float away as miniature bergs.

9th. The ice is still very loose, and there is a wide belt of water round the shore.

10th. The ice has closed in again; nevertheless there is navigable water round the shore.

11th. The ice is fast closing in upon the land.

13th. No perceptible change has taken place. There is still navigable water several miles wide round the shore, while the ice beyond is compact and stationary.

14th. Cracks in the ice held between reefs and the shore are widening.

17th. During the past few days the ice has become much looser, and now is quite navigable from the shore to the horizon.

18th. With the exception of a long regular line of compact ice near the horizon, there are now only a few loose pans between it and the shore.

19th. The ice appears to be closing in upon the land again.

20th. The inner edge of the pack is now about ten miles off.

22nd. No change appears to have taken place.

23rd, 24th. Foggy; cannot see beyond the shore.

25th. Loose ice now occupies most of the water seen recently, but it is still quite navigable.

26th, 27th. No change.

28th to 31st. The ice has remained very loose throughout, sometimes closing a little, but soon after opening again.

June, 1886.

1st. Only scattered pieces of ice can now be seen between the shore and the horizon, the water being quite navigable for the smallest craft. A large portion of the ice between the reefs and the shore gave way to-day, so that it would now be possible to bring a ship within a mile of the observatory.

2nd and 3rd. Fog covered the Strait all day.

4th. The prevailing strong northerly wind is driving the ice to this side of the Strait, and the inner edge of the pack is now fast approaching.

5th. Once more the ice has closed in upon the shore, and as far as can be seen the pack is unbroken.

6th to 13th. No change has taken place. Not the smallest lead of water has been seen. The ice is now getting very soft, and wherever there is an accumulation of dirt on the ice, such as dust blown off the shore, the ice is melting very fast.

14th, 15th. The ice is rather looser.

16th. Foggy over the Strait.

17th to 21st. The pack, though occasionally opening, is not navigable.

22nd, 23rd. The ice is much looser, and a few small leads of open water can be seen.

24th, 25th, 26th. The ice is compact throughout.

27th. Ice is still compact. Round the edges of the shore the ice is melting very fast, and in a great many of the bays it is breaking up near high water mark.

28th, 29th. The ice remains compact, but the pans are rapidly becoming smaller as they break up with the force of the tides.

30th. The wind shifting to the S.W., the ice became much looser, and now small leads can be seen here and there.

July, 1886.

1st. The ice has again packed very tightly.

2nd. Towards evening the ice became much looser in all directions.

3rd to 7th. The pack has continued comparatively open, but at no time has been navigable.

8th. Ice is again compact. A long line of what appears to be a "water sky" can be seen on the horizon.

9th, 10th. No change in the condition of the ice.

11th. The pack is now open to the eastward, otherwise no change has taken place. There is a long dark line near the horizon that looks much like open water.

12th. The ice is much looser.

13th. The ice is open and almost navigable from the shore to the horizon. All the ice left the harbour to-day, and now all bays are open.

14th. The pack closed in again to-day, filling all the bays with loose ice.

15th. Ice remains compact, excepting to the eastward, where it is more open.

16th to 19th. No change has taken place during the past few days.

20th, 21st, 22nd. Owing to fog hanging over the Strait, it was impossible to see beyond the shore.

23rd. A good view of the Strait was obtained to-day. The pack is now very open and is quite navigable throughout. Eskimo think this is the last of the ice.

24th. Along the shore there is now only some scattered ice, pieces of which came into the bay, and appeared to be quite foreign to the ice formed here. Some pieces measured fifteen feet in thickness, and at their base leaves were found imprisoned in the ice, from which I should suppose these were nothing more than hardened snow that had drifted from the shore.

25th, 26th. No change has taken place.

27th. Fog completely hid the Strait to-day.

28th. Now only small quantities of loose ice can be seen, floating freely to the eastward.

29th to 31st. Dense fog during the past three days.

August, 1886.

1st. Owing to fog, could only see a few miles from shore. There only appeared to be a little loose ice here and there.

2nd. The prevailing strong north-westerly wind is driving what little ice there is in the bays out to sea. A little ice can be seen near the horizon.

3rd. The Strait remains open to the northward and north-eastward, whilst loose ice extends from the shore to the horizon. Blocks of ice, twenty-five feet in thickness, have stranded in this and neighbouring bays.

4th, 5th, 6th. Only very scattered ice can now be seen.

7th. Fewer pieces of ice are to be seen. These shift about with the tides and eventually drift to the eastward.

8th and 9th. Misty weather has quite hidden the Strait.

10th. It now may be said this part of the Strait is free of ice, excepting a few pieces that drift off the shore. These are so few that they might easily be counted,

11th. An unbroken line of ice can be seen along the horizon.

12th. The field ice seen upon the horizon has moved nearer the coast. A bark can be seen nearer the inner edge of the pack, apparently looking for an opening.

13th. Fog has hung over the Strait all day. The bark is in sight.

14th. The ice seen during the past few days proves to be only a belt, both sides of which can now be seen. It is quickly moving to the eastward. The bark was last seen this evening.

15th, 16th, 17th. Only a few scattered pieces of ice can now be seen.

18th. A long line of ice can be seen near the eastern horizon.

19th. The ice seen on the eastern horizon has disappeared.

20th, 21st. Only some very small pieces of ice were seen.

22nd. A small berg seen to the north-eastward.

23rd to 27th. No ice has been seen during the past five days.

28th. A large iceberg seen on the horizon to the north-eastward.

29th, 30th. No ice to be seen.

September, 1886.

1st to 15th. No ice has been seen.

PORT DE BOUCHERVILLE, NOTTINGHAM ISLAND.

ICE RECORD.

September, 1885.

1st to 11th. No ice has been seen.

11th. A large iceberg is moving east; it appeared to come from the direction of Salisbury Island.

18th. SS. "Alert" called, homeward bound.

20th. All fresh water ponds are frozen over.

26th. At 2 p.m. saw field ice for the first time since landing. It extends from south-east northward, and lies some six or eight miles off shore at its southern boundary, approaching nearer the shore to the northward, and seems to be continuous between Salisbury Island and Nottingham.

27th. Ice all round, and has come close to shore to the northward. No open water visible to north-east or east.

28th. Ice formed on the harbour; field ice covering the Straits in every direction, with small spots of open water showing.

29th. Some pieces of the broken floe came into the harbour and grounded at low tide; they are from 15 to 20 feet thick.

30th. The ice has all drifted off to the eastward. At 5 p.m. to-night, no ice in sight except a few scattered pieces and the faint line of white on the horizon.

October, 1886.

1st. The pack has drifted back again, and is to-day nearer the shore to the northward than yesterday.

3rd. The ice is now tight and compact in every direction; from the top of a hill some distance inland, a little open water shows near the horizon between south and east; elsewhere no water to be seen. The bay to the north of the station is frozen so that the seals can lie on it.

4th, 5th, 6th, 7th. Ice in every direction, slackening and tightening with the tide; at times large lakes of open water show.

8th, 9th. Ice still generally covers the whole of the Straits as far as can be seen, but the amount of open water showing is greater than before.

10th, 11th. Not much change in the ice.

12th. Open water to the east and north-east; extends to the horizon.

14th, 15th. Ice lines the shores of the island, and extends out for seven or eight miles; beyond this, open water reaches to the horizon.

17th. Open water can just be seen on the horizon between east and south-east; inshore there are a few small patches of open water; with these exceptions, my whole sea view is covered with pack-ice. Harbour all frozen over to-day.

18th. A belt of ice from 5 to 8 inches wide lies along shore. Open water showing beyond.

19th. Open water only shows on the horizon.

20th, 21st, 22nd, 23rd. Ice slack; a good deal of open water showing up.

24th. Foggy.

25th. In the morning the ice had been driven off to the horizon, but by 4 p.m. had returned to within a mile of the shore.

26th, 27th. Ice to east and N. E. is tight, but slack ice and open water show to south and S. W.

28th, 29th. Ice tight in every direction.

30th, 31st. Ice still covers the Strait in every direction, but spots of open water show in some places.

November, 1885.

1st, 2nd. Westerly winds have driven the pack off shore, leaving open water with a few stray pieces of floe floating here and there in it. The body of the ice can just be seen on the horizon.

3rd. Ice has come back to the shore again, but is very slack. Appearance of the Straits is about half ice and half water.

4th. Ice has again tightened up, leaving only a few narrow leads of open water.

5th. Ice is again slack.

6th. At 3.15 p.m., with the exception of a narrow lead of open water close inshore, there is nothing but closely packed ice to be seen to seaward.

7th, 8th, 9th, 10th. Ice opens out and occasionally swings off the shore a few miles and then returning, packs tight on the shore; this goes on with shifting of wind and changes of tide.

11th, 12th, 13th, 14th. Ice has remained close. No open water has been seen.

15th, 16th. No open water.

17th. Water sky to south, but no open water visible.

18th. Snowing and drifting; cannot see any distance.

19th, 20th. Ice still tight. No open water visible. An iceberg which was to the N. E. has been carried south, and now bears south of east.

21st. Ice still tight for three or four miles from shore; slacker beyond. The iceberg seen yesterday has passed out of sight to the eastward.

22nd. Ice loose to the south; elsewhere it is tight.

23rd, 24th. Ice a little looser, generally.

25th. At 9 a.m. the gale has blown all the ice out to sea, to the eastward.

29th. Stormy but open water; as far as can be seen.

27th. Ice has apparently come in again to the south, but mist hangs over the straits.

28th. Again misty.

29th. No ice in sight, except on the horizon to the northward.

30th. Snowing and drifting. View of straits completely shut out.

December, 1885.

1st. Snowing heavily; cannot see beyond the mouth of the harbour.

2nd. Ice has again closed in, and there is no open water to be seen in any direction.

3rd, 4th. No open water in sight.

5th, 6th. Storm and mist; cannot see out into the Straits.

7th, 8th, 9th, 10th. No open water visible.

11th, 12th, 13th. Open water near shore, but dense vapour, which rises, prevents my seeing more than a mile.

14th. Open water on the horizon to the south; there is also a lead of water in shore, running north as far as I can see, becoming wider as it gets farther north, at N. E. it extends clear to the horizon.

15th. The ice has come closer in to the south; to the northward, not much change.

16th. Not much change in the ice.

17th, 18th. Ice remains about the same.

19th, 20th, 21st. Cannot see any great distance owing to vapour rising from the open water.

22nd, 23rd, 24th, 25th. There is evidently much open water in the neighbourhood, though I cannot see any great distance, except at intervals; the ice moves freely with wind and tide.

26th. Weather clear to-day; saw the south coast and the Straits and Salisbury Island for the first time for a number of days. Comparatively clear water in every direction.

27th, 28th. Snowing and drifting; cannot see out into the Straits.

29th, 30th. Snowing and drifting still.

31st. Weather hazy, and cannot see more than 3 or 4 miles. There is open water as far as we can see to N.E., and a small patch near the mouth of the harbour; elsewhere the ice covers the Straits as far as visible.

January, 1886.

1st to 7th. From snow-drift and vapour, have not been able to see any distance.

8th. Open water shows about three miles off the shore and parallel to it. There is no change in the appearance of the ice.

9th. Unable to see any distance from the shore to-day.

10th to 16th. Have never seen clear to the horizon; there is generally some open water in sight, altering its position with the wind and tide.

17th. The only open water in sight, is a few small patches to S.E., although the view is good, Salisbury Island being distinctly visible. Ice is packed very tightly.

18th, 19th. A few small strips of open water show. Vapour bands again obstruct the view of the horizon.

20th to 24th. Unable to see any distance.

25th. Ice moves with the tide, opening and closing the land to the N.E., south of this the ice remains tightly packed.

26th, 27th. Cannot see out into the Straits.

28th, 29th. Ice is looser, but the usual heavy clouds of vapour obstruct the view of the Straits.

30th. View good to-day. To the south, the Straits seem to be tightly filled with field ice, to the horizon. Between N.E. and S.E. the heavy ice lies not less than 5 or 6 miles off shore. Between Nothingham and Salisbury no open water shows.

31st. View again good. Ice seems a little loose to the south, otherwise no change.

February, 1886.

1st, 2nd. Cannot see any distance.

3rd. From high ground inland the Straits are packed tightly with heavy ice, the only exception is to S.E., where a few small lakes of open water show.

4th, 5th. Cannot see any distance.

6th. Can see nearly to horizon. Ice generally tight.

7th, 8th. Large patches of open water show.

9th, 10th. View of Straits interrupted.

12th. There is a strip of water between here and Salisbury Island, elsewhere the ice is solid.

13th. Ice tight everywhere.

14th, 15th, 16th. Heavy gale and snow drift.

17th. Ice has moved out some 4 or 5 miles and swings in again.

18th. Cloudy horizon again.

20th. No open water to be seen.

21st, 22nd. Ice tight everywhere.

23rd. View obstructed.

24th. Large patches of open water south of the harbour some three or four miles from shore, to the north the ice is packed tightly to the horizon.

25th, 26th, 27th. Not much change in the ice.

28th. Large patches of open water to E. and N.E. View is, however, somewhat poor.

March, 1886.

1st, 2nd. Ice packed tightly to horizon. No open water visible.

3rd, 4th. No open water.

5th. A little open water to N.E., but cannot see any great distance owing to vapour hanging over the ice. To the south no open water shows.

6th. A lane of open water runs north and south, some five miles off shore.

7th, 8th, 9th. Ice generally tight, small leads of water only showing occasionally.

10th. This morning about 70 per cent. of the Straits is clear, the ice having run abroad very freely. In the afternoon the ice packed in tightly again on the shore.

11th, 12th, 13th. Cannot see any distance.

14th. No open water in sight.

15th. Snow drifting. View of Straits obscured.

16th. Ice is packed tightly, to the south, and also between here and Salisbury Island, but east of this large lakes of open water show some five or six miles from shore.

17th, 18th. View poor. No open water visible.

19th. View good. No open water in sight.

20th to 26th. Ice moves a little with the tide and small patches of open water show at times.

27th, 28th, 29th, 30th, 31st. Ice tight, no open water to be seen.

April, 1886.

1st, 2nd. No open water in sight.

3rd. Ice slackened off a little to-day.

4th, 5th. Ice tight, no open water.

7th. Ice loosened to-day, long lanes of open water running parallel to the shore, alternate with belts of ice as far as can be seen.

8th, 9th, 10th, 11th. Not much change in the ice.

12th. The ice remained close all day.

13th. No change of any importance, small leads of water show at certain times of tide.

14th. A good deal of open water shows to S.E.

15th, 16th, 17th. Weather stormy, Straits obscured.

20th, 21st. Ice has moved off bodily to the eastward leaving clear water in all directions; south of east the ice between Nottingham and Salisbury remains intact.

22nd, 23rd. Loose ice in every direction swinging with the tide.

24th, 25th, 26th. Ice tight. No open water.

27th. Ice has again slackened, and leads of open water show through it.

28th, 29th, 30th. Not much change in the ice; at times it is tight, and again, occasionally it will slacken off.

May, 1886.

1st. To the south the ice has moved off and clear water extends to the horizon, about S.E. the ice just shows on the horizon, and to the north of this it comes close to shore.

2nd, 3rd, 4th, 5th. Weather stormy, Straits obscured.

6th, 7th. A little open water shows occasionally; on the 7th some of the sea birds put in an appearance for the first time.

8th, 9th, 10th. No change in the ice.

11th, 12th, 13th. No open water, ice tight on the shore.

14th. Ice slackened off a little to-day.

15th, 16th. Snow drifting, view of Straits obscured.

17th. No open water, but the ice seems much broken up by the late gale.

19th. A little open water to the south.

20th, 21st. The ice has been blown off the shore and has come back again, but remains loose, with a good deal of open water showing.

22nd, 23rd, 24th, 25th, 26th, 27th. Ice tight, no open water visible.

28th. Foggy all day.

29th. Visibility good, no open water can be seen from the top of the hill to north of station.

30th, 31st. No open water visible.

June, 1886.

1st to 6th. Ice tightly packed the whole time, no open water shows except a small pond or two in the eddy under a point.

7th. Could not see any distance.

8th. Ice slackened off considerably.

9th, 16th. No open water of any extent has been seen.

17th. A good deal of open water shows up to-day.

18th. In the morning the ice is slack, aud a good deal of open water shows, but in the afternoon it again came in tight and no open water was to be seen.

19th. No open water.

20th. Ice loosened out to-day again, and moved off the shore some four or five miles to the south; large patches of open water extend to the horizon.

22nd. Harbour ice begins to look shaky, and water appears at head of tide, here.

24th. Ice to the south continues quite slack, about 50 per cent. of open water shows there; to the north of east the ice is still tight.

25th, 26th, 27th, 28th. No change in the ice.

29th. From south round to N.E. the ice has been blown off shore and appears quite loose; north of N.E. it remains tightly packed.

30th. Harbour ice is all broken up, leaving only a narrow strip a few hundred yards wide across at the shoals.

July, 1886.

1st, 2nd. Ice loose as far as can be seen.

3rd. Easterly wind has brought the ice in and it is now a good deal tighter, though open water shows in places.

4th. Foggy.

6th. Open water shows to the south.

8th. Ice apparently remains about the same; compact between here and Salisbury Island, but quite loose to the south, where occasionally the open water extends to the horizon.

9th, 10th, 11th. No open water in sight.

12th. S.W. wind has blown the ice off shore.

13th. Ice to the northward and between here and Salisbury seems compact, but the Straits to the south must be nearly clear as we could hear the sea breaking on the outer edge of the ice near the shore to the south.

14th. View poor.

15th, 16th. Ice tightly packed in on the shore; no open water.

17th. Ice loosened out a little and some open water shows in places.

18th, 22nd. Ice remains loose; much open water.

23rd, 24th. Open water along shore, but ice visible on the horizon.

25th, 26th. Ice swings in a little occasionally, but it is always loose and much broken up.

28th, 8 p.m. Ice packed tightly in all directions.

29th, 30th. Not a particle of open water to be seen. Ice packed tightly to the horizon.

31st. Could not see any distance; the wash of the sea could be heard plainly to the south.

August, 1886.

1st. About fifty per cent of open water, mostly to the south.

2nd, 7th. Comparatively open water nearly all the time.

9th. Ice was running N.E. to-day, at 7 p.m. the only open water visible is a lead close in to the shore and a few spots on the horizon.

10th. Ice slackened off again today.

11th, 16th. Ice quite loose at all times.

17th. Cannot see any distance, but the ice must be all gone as a heavy sea is breaking on the shoals.

18th. View good; no ice visible out at sea.

PORT LAPERRIERE.

ICE OBSERVATIONS.—OBSERVER, MR. P. C. WOODWORTH.

October, 1885.

1st. First field ice seen to-day at 4 p.m. The ice is loose and there are some bergs driving with it. The pack is apparently moving S.E.

2nd, 4th. The Strait is covered with loose ice. It is heavy old ice, some of it being aground here in the harbour.

8th. Harbour packed tightly with heavy old ice and it can be seen in the Strait and Bay as far as the eye can reach. It is apparently moving north.

14th. No ice visible in Bay or Strait.

29th. About 2 inches of ice formed on the harbour last night but broke up again in the morning.

November, 1885.

1st. No ice in sight.

3rd. A narrow belt of old field ice extends from N.W. to N.E., and about eight miles off shore.

5th. Some field ice in the Strait. Harbour is now frozen over.

7th. Field ice has passed out of sight, only a few stray pieces being seen to-day.

12th. Young ice forming over Bay and Strait.

13th, 14th. Pack of old ice, which has moved down from the north can be seen in the Strait to-day.

15th. Old ice has passed eastward; none now in sight.

17th, 23rd. New ice forming in Bay and Strait.

24th. Straits closely packed with ice.

29th. Bay and Straits full of ice. It is, however, loose and swings with the tide.

December, 1885.

1st. Could get no view of Bay or Strait to-day; blinding snow drift.

2nd. The ice appears closely packed in the Bay and Strait. I am quite certain that all the ice that I have seen in the Strait and Bay is heavy old ice, the separate floe pieces having been cemented together by young ice.

3rd, 4th. Ice in Bay and Strait compact.

5th. Snow drifting.

6th. A little open water shows at one place in the Straits; elsewhere the ice remains solid.

7th, 8th. No open water visible anywhere.

9th, 10th. A little open water in the Bay; none visible in the Straits.

11th. Open water in the Bay extends as far as can be seen. A good deal of open water also shows in the Strait.

13th. No open water visible in the Straits.

14th, 15th. Ice remains the same.

16th. Small spots of open water are numerous in the Straits.

17th. No open water in sight to-day from the station.

20th to 31st. Ice remains much the same; a little open water showing occasionally in both the Bay and Strait.

January, 1886.

1st to 31st. Very little movement in the ice; great banks of vapour constantly rise from what are apparently cracks in the ice; this vapour prevents our observing the movement of the ice at any distance out. Near shore no change has taken place.

February, 1886.

1st to 10th. Vapour banks obstruct the view of both Bay and Strait.

11th. Some open water is visible, apparently about twelve miles off, in both Strait and Bay.

12th. Ice seems to have loosened, as numerous small pools of open water show in the Straits.

13th to 15th. No open water in sight.

16th. A little open water visible in the Strait.

18th, 19th. Banks of vapour again obstruct the view of the Straits.

20th. A little open water shows near the shore.

22nd to 26th. Clouds of vapour, rising some distance off shore, obstruct the view of the Strait.

27th. A little open water, apparently about fifteen miles off shore.

March, 1886.

3rd. Some narrow leads of open water are visible about five miles off shore on the Bay side, but come within half a mile of the island on the Strait's side.

5th to 16th. View obstructed by dense banks of vapour rising from the ice.

17th. A narrow strip of open water a few miles out in the Strait to-night at 11 p.m.

18th. A little open water in both Strait and Bay.

19th to 21st. Ice remains unchanged, the same narrow strip of open water still showing in both Strait and Bay.

22nd, 23rd. Ice moving with the tide; open water showing occasionally.

24th. Ice off the shore, open water clear in to the western side of the island to-day.

25th, 26th. Stormy, with drifting snow; view of the Straits obscured.

27th to 29th. Hazy in Bay and Straits.

30th. There is a strip of open water in the Strait about two miles off shore, which is about four miles in width, extending east and west, as far as can be seen.

31st. Foggy over the Bay and Straits.

April, 1886.

2nd, 3rd. More open water than before; it is now, I estimate, about ten miles from ice to ice, and the open water extends from the north-west in the Bay round to the eastward in the Straits as far as can be seen.

4th. The open water reported yesterday is now all closed, but the ice is loose and moves freely with the tide; spots of open water show in different places.

5th to 9th. A little open water always seen in both Bay and Strait.

10th. No open water in the Straits to-day.

11th. Weather thick; cannot see any distance.

12th, 13th, 14th, 15th, 16th. Only a little open water shows occasionally.

20th, 23rd. More open water than has been seen for some time, but principally in the Bay; very little in the Straits.

29th. Very heavy ice in both Straits and Bay; no open water in the Strait.

30th. No open water in sight.

May, 1886.

2nd. A little open water shows in both Bay and Strait.

3rd to 5th. Snowing and drifting.

6th to 15th. Open water is seen every day in narrow leads, shifting as the ice moves with the tide.

16th. Very stormy.

17th to 20th. Narrow leads of open water in the Bay. None reported in the Straits.

21st. The ice in the Straits is looser, and some open water shows there in places, but the ice is very heavy, and of a deep blue color.

22nd. From the top of one of the hills open water shows in the Bay, about 15 miles in width; this extends into the Strait, where it is apparently from 10 to 12 miles in width.

23rd to 31st. Open water in narrow leads is seen every day; they open and close with the phases of the tide.

June, 1886.

1st to 6th. Streaks of open water seen every day, in both Bay and Strait.

8th. A long narrow lead of water in the Straits to-day.

17th. Ice in Straits is very loose; a great deal of open water shows.

18th, 19th. Ice continues loose.

20th. The ice near the shore, is getting quite thin and is full of holes.

21st at 3 a.m. The floe broke away from the harbour's mouth and drifted to the westward, leaving clear water for a considerable distance.

22nd, 23rd. Ice quite loose. There would, I think, be now no difficulty in a steamship making a passage into the Bay.

24th, 26th. Ice continued loose.

27th. Ice has closed up again completely; no open water is visible.

28th to 30th. Ice loosened out in the Straits again, but not to any great extent, only small pools of open water showing. In the Bay the ice swings right off to the horizon, and comes back with the tide.

July, 1886.

1st. No open water visible in the Strait.

2nd. Ice in Straits much the same, though a few small pools of open water show some distance out. In the Bay the water sky extends from S.W. nearly to N.W. and the freedom with which the pack swings off, indicates that there is not a great breadth of ice.

3rd. Ice in the Bay remains heavy, but there is a narrow lead of open water formed under the shores of the island which extends well out into the Bay.

4th. At 3 a.m. the water still showed close to the island, but at 11 a.m. it had closed up again.

5th to 9th. Weather thick over the Straits, could not see any distance.

10th. Ice in the Strait is quite slack, and by no means so heavy as it was.

11th. Examined the Straits from the top of a high hill to north of harbour. Ice compact for a long distance out, and then a lead of open water shows, apparently extending to Nottingham Island.

12th. A bank of fog rests on the horizon, apparently where the open water was seen yesterday.

13th, 14th. Ice in the Straits remains compact.

15th. Harbour ice begins to break up.

16th. Straits full of heavy ice. No open water is visible.

17th, 18th. Ice loosened a good deal, and now on the night of the 18th, our harbour ice is completely broken up, and heavy ice from the Bay has drifted in.

19th, A good deal of open water shows in the Straits to-day, the run of the belts of ice being about parallel to the shore. At 1.45 p.m. saw the "Alert" away to N.E.

20th. Foggy to-day. "Alert" got into the harbour and anchored, a little before noon.

24th. More open water visible in the Straits to-day than I have yet seen.

25th. Ice out in the Strait seems quite loose; the "Alert" left this morning but at 2 p.m. was seen; apparently stuck fast in the pack.

26th. Foggy.

27th. A large ship, supposed to be a whaler, passed to day. Ice quite slack all about.

28th, 30th. The amount of ice in both Bay and Strait diminishes daily. Eskimo are coming over from the mainland in their kayaks.

August.

2nd. There is now more open water to be seen in both Strait and Bay than there is ice, and the ice is very slack.

3rd. Harbour drifted nearly full of heavy ice.

4th. Open water as far as can be seen.

13th. There now appear in the Straits two narrow belts of ice, about one mile in width, and apparently from 10 to 15 miles in length.

22nd. Not a particle of ice visible in any direction, nor was any more seen from this date to the end of the month.

31st. "Alert" in the harbour, house being taken down; all observations discontinued.

SUMMARY OF ICE REPORTS OF THE STATIONS.

For the benefit of those who cannot afford the time to examine and compare the ice reports of the two years, I give the following summary of the facts observed in both seasons.

At Port Laperrière, in the spring of 1885, a good deal of open water was seen during the early part of the month of June, but the Straits are not reported as at all clear until 17th July; the last of the ice disappearing on 22nd August, just as the fresh water ice begins to form, on the inland lakes. In 1886, some open water showed in the month of March. On 17th June the observer reports the ice quite loose, and thinks Straits navigable. On the 23rd the ice however closed in again almost at once, and up to and including 16th July the Straits are full of heavy ice, which gets loose on the 19th, and by the 26th the Straits are considered navigable; the first day on which no ice in sight is reported, being 22nd August, the same date to a day, as in 1885.

On the other side of the Straits, at Port de Boucherville, on Nottingham Island; in the spring of 1885; 11th July is the first day that any considerable amount of open water is reported; 24th July, the ice is loose in every direction; and the last ice is seen on 13th August. In 1886, on 13th July, first heard the wash of the sea, and though the ice closed in again on the 9th August, it had all left by 17th August.

At Stupart's Bay in 1885, on 3rd June, Eskimo report that water could be seen, but up to 20th July no large amount of open water is reported; the last ice was seen on 8th August. In 1886; 23rd July, ice reported quite loose, the observer remarking "Straits now navigable;" the last ice seen was on 19th August. I may add that in 1884 the last ice was seen here on the 8th of September.

At Ashe Inlet, in 1885, from 10th to 26th June, the ice was loose, but about the latter date it came in on the shore again, remaining with scarcely a break up to 21st August; there was, however, clear water reported some 10 or 12 miles off shore during a great part of July. In 1886, a good deal of open water was seen in April, and on 5th June the ice moved off shore, remaining clear several days, subsequently going off again about 11th July. On 21st July, it is reported, ice in tight again, no open water in sight. The ice finally disappeared on 16th August.

At Port Burwell, in 1885; there was a deal of open water seen during July, but the ice always closed in again. The "Alert" got into harbour here on 4th August. Ice finally disappeared on 20th August. In 1886, from 13th to 20th June the ice was loose, but from the latter date to the end of July a great deal of ice was seen 3rd August is the first day on which the entry is made, "no ice in sight."

The comparison of the closing of the two seasons, in the fall of the years 1884 and 1885, is given below.

Port Laperrière and Nottingham Island. During the season of 1884, the field ice never left the Nottingham Island, but remained there, swinging to and fro with the tide, all summer. On 2nd October, at Nottingham Island, the Straits are reported full of ice as far as can be seen, and the date of the final closing fixed by the observer there was 26th October. At Port Laperrière, first ice 19th October. Straits closed, apparently full of ice, 22nd October.

In 1885, at Nottingham Island, first ice 26th September. Straits full and finally closed on 26th October. At Port Laperrière, on the opposite side of the Straits, the first ice was seen on 1st October; it came down in considerable quantity, but owing to heavy weather and westerly gales did not set tight till 2nd December.

At Stupart's Bay, in 1884, first ice 22nd October, but observer does not consider Straits closed at that point until 7th December.

In 1885, temporarily closed 14th November, but this ice moving east, were finally closed 6th December.

At Ashe Inlet, in 1884, first ice is reported 14th November, and Straits finally closed 21st November. In 1885, first ice 26th October, but Straits not closed till 6th December.

At Port Burwell the observer reports, in 1884, first ice 4th November; Straits apparently full on 12th November. In 1885, first ice 20th November; Straits apparently closed 30th November.

NOTES ON THE ICE IN HUDSON'S STRAITS AND BAY.

In considering the question of the quantity and movements of the ice in Hudson's Straits, the first point that arises is whether the only ice to be met with there is that formed in the immediate locality, or whether there are sources of supply beyond.

We have now had voyages on three years to Hudson's Straits, and it is certainly legitimate to assume that we have met with all the kinds of ice which are at any time to be found in these regions. I consider that they may be divided into three types or classes:—First, there are in Hudson's Straits at all times of the year, icebergs; second, up to the end of July or beginning of August there is much young floe ice, by this is meant the ice which has been formed during the winter immediately preceding. Its thickness is variously reported from 7 feet 6 inches at the harbour on Marble Island to 3 feet 10 inches at Port Burwell, in the eastern entrance of the Straits. A mean between these two measures would be, I consider, a fair average, for the thickness of this class of ice, when met with in Hudson's Straits, say somewhere about 5 feet of solid blue ice; covering this ice is a sheet of snow packed solid and as hard as the ice itself, and, like the ice, of varying depth. In the month of July 2 feet would probably be the average depth of this cap or crust of snow, thus making the total depth of ice and snow together from 7 to 9 feet. This ice honeycombs very quickly, and in July is generally full of water holes, which occasionally are so extensive that they give a floe of this description the appearance of being made up of a number of detached pieces. I have indeed more than once, forced the ship into a floe of this kind, only to find that there was no give to it at all, and nothing to be done but to pull astern, and go on coasting round the sheet.

The third type of ice is what I called in my first year's report the "heavy Arctic ice." This ice is of every thickness, from 10 to 40 feet; it is the product of many winters in which it has been growing in thickness, both below by freezing, and above by the [illegible]tion of the successive winters' snows.

[illegible] large masses of this heavy old ice are met with in Hudson's Straits, [illegible] [illegible]inguished from the young floe of the single winter's production [illegible] always rough and hummocky; it also quickly discolors, turning [illegible] besides being hummocky, the surface is covered with crater like

holes, full, in most instances, of the finest fresh water. It was indeed quite a common occurrence to put the ship alongside a piece of old ice and putting out the suction hose to fill the tanks with fresh water in a few minutes by means of the steam pump.

We have then these three kinds of ice, viz., (1) icebergs; (2) young floe ice, of single winter's growth; (3) heavy Arctic, or old ice.

Our observations made now during three seasons show that icebergs are present at all times of the year; that young ice makes to a considerable thickness before the 1st December, and that the old ice is occasionally present in the Straits, at the western end, during the whole season; that at other times its final disappearance takes place at some date in August, and that it returns in force usually about the latter part of October.

In considering the quantity and movements of this ice during the season in which navigation is possible, it is desirable that I should again point out, that the physical and geographical features of the region, are of a most unpromising nature. First, in regard to temperature, I am convinced that the mean monthly temperatures proven now to exist preclude all ideas of the possibility of navigating the Straits from November to April, inclusive. In May, June and July, large quantities of ice are present in the Straits, and as the average temperature of the western end of the Straits in May is 23° Fah., or $5\frac{1}{2}$° below the freezing point of salt water, the ice does not begin to give way in this month. By the months of June and July the temperature here has risen to 35° and 40° respectively, and the ice honeycombs and melts rapidly; but judging from the reports of the stations and our own experience it takes all of June, and generally part of July, to reduce the quantity sufficiently, to permit of the Straits being navigated for the purposes of commerce.

The general direction of Hudson's Straits at the eastern end, is about N.W. and S.E. (true), and across the mouth of the Straits, flows persistently the great Arctic current, carrying with it, not only the giant bergs, from the Humboldt and other glaciers, but field ice from the Arctic Sea coming down the East Greenland coast, together with all that comes down Davis' Straits and from out of its many bays and fjords. The quantity of this ice, which passes down across the mouth of Hudson's Straits is enormous, nor does it all pass across; a great deal of it is carried right into Hudson's Straits to the south of Resolution Island; more comes in through Gabriel Straits and thence flows westward along the north shore of Hudson's Straits. This westerly set apparently terminates about the eastern side of Salisbury Island, because the bergs are seen to come in the Straits, and to pass up the north side going west beyond Ashe Inlet; but at Nottingham Island only one is reported as having been seen; at Stupart's Bay they are frequently reported going east. It is therefore a legitimate conclusion, that the current from Davis' Straits flows west along the north shore of Hudson's Straits, and east on the south side. The breadth of ice outside of Hudson's Straits varies greatly from time to time. I have been told of its being 120 miles off in March, and this year, in the end of May, Capt. Guy, of the "Arctic," says: "We found the south-west ice extending off Resolution Island from 40 to 50 miles of tight ice, and outside of this from 10 to 20 miles of slack ice"; showing up to the 25th of May, this year, an impenetrable barrier of 50 miles of tight ice between navigable water and the entrance of Hudson's Straits. This mass of ice outside, pens up the ice in Hudson's Straits, and it is only after a westerly blow of some duration, that it moves off to the eastward and permits of the ice moving out. About the end of June or beginning of July, the bulk of the northern ice has passed south of Cape Chidley, and the Hudson's Straits ice is free to pass out, but at this season of the year the westerly winds form only about 30 per cent. of the total, hence the discharge is slow and vast quantities of this ice disappear in the Straits and Ungava Bay under the influence of the rising temperature of both air and sea.

It will be admitted that with the experience extending to centuries, which the Hudson's Bay Company have if it were possible for them to get their ships in earlier they would endeavour to do so; inasmuch as the detention of one of their ships over a winter in the bay, entails loss of markets, more or less undue wear and tear of vessel, and the additional expense of wages and maintenance of the crew. I have

examined the records of 116 consecutive arrivals at York Factory and find that the average date is September 4th. Of the 116, 48 arrived in August; earliest date, 6th August. The latest arrival was the 7th October, on which occasion the ship wintered in the bay.

There is no question, but that the year in which the ship arrived 6th August, must have been an exceptionally favourable one, because of all the August arrivals only 13 arrived prior to the 20th of the month, and in considering the question of the navigability of the Straits by steamships for the ordinary purposes of commerce, I am of the opinion that steam will not lengthen the season at the beginning more than a month to five weeks, so that our own experience, and that of the Hudson's Bay ships, points to the first half of July as being the earliest date at which the Straits may be considered navigable for the purposes of commerce, by steamships fortified for ice navigation, and at the same time capable of being used profitably as freight carriers.

It has been held by some that the ice in Hudson's Straits was so light and so much broken up that there was no risk of an ordinary vessel being crushed in it. I am informed that one of the American whaling vessels was crushed in 1885, and the Hudson's Bay Company some years since lost a vessel by the ice in the Strait.

The Hakluyt Society have published a work entitled "The Geography of Hudson's Bay," by Capt. Coats.

Capt. Coats was an officer in the Hudson's Bay Company, who commanded vessels sailing into Hudson's Bay from 1727 to 1751. During this time he was twice crushed in the ice, and in his geography he says: "In the year 1727 when near the meridian off Cape Farewell, when running through the ice with small sail, two pieces of ice shut upon us and sunk our ship. Again in 1736, being entangled in the ice six leagues within Cape Resolution when the ice shut upon us by the tides only (for it was dead calm) and crushed our sides in and sunk her in 20 minutes."

The tidal currents in the Straits flow with great rapidity, especially at the eastern end of the Strait, round and about the Button's Islands, and at the western end near the Digges Islands; any vessel getting entangled in the running ice in these currents is sure to meet with hard usage, if not with actual disaster. The ice does not move with uniform speed, but wheels and whirls in every direction the heavier floe pieces, some of them approaching the size of small bergs tearing through the pack, leaving a wake of clear water for a short distance in rear of them, which is almost immediately filled again, the ice rushing together, and the smaller pieces crushed or lifted out of the water as the opposing lines meet. It is on account of these currents, that Capt. Coats advises the mariner navigating Hudson's Straits not to enter the Straits till the first week of July, by which time, he says, the ice is usually sufficiently broken up to make it safe for a ship. I cannot better show how the uncertainties of these tidal currents defy the calculations of the navigator than by instancing the case of Capt. Parry's expedition with the "Fury" and "Hecla" in 1821. Capt. Parry arrived off Resolution Island on 2nd July, and from this date the "Fury" and "Hecla" were drifting in the ice, working as opportunity offered. They reached the Lower Savage Islands on 18th July. On 6th July the two ships were close together, and were tightly beset in the ice, the weather then shut down thick, but neither ship was released from the close grip of the ice. On the following day when the weather cleared, the "Hecla" had drifted eleven miles away from her consort. I have examined the published records of a number of voyages made by the early explorers of the seventeenth century, and those of later date. In all the testimony is the same, that there is a large quantity of ice in Hudson's Straits during the month of July, more or less broken up, still it is always there.

In concluding these notes on the ice, it may not be out of place to state that whilst I am of opinion there will always be more or less fluctuation in the date of the opening of practical navigation for the purposes of commerce, the ship owner who sends in a freight-carrying steamer before the 15th of July, will almost certainly be subjected to such delays as will add very seriously to the cost of the voyage; indeed it is by no means unlikely that given two similar steamships, one entering

Hudson's Straits, on 5th July and the other on the 15th, the second steamer might pass the first, and get through with little delay.

In regard to the closing of the season so far as obstruction from ice is concerned the end of October seems to be the time when the heavy old ice comes down in force, and although in 1886 this ice was driven eastwards by a heavy gale and the Strait remained open for some time longer, the temperatures have in November fallen so low, and the days have become so short, that the risks of navigation are seriously agumented. In estimating the period of navigation of an ordinary year I should say from 15th July to 15th October with a possibility of navigation from 1st July to 1st November, but in the first half of July and indeed occasionally in the latter half there will always be delays, and later than 15th October the risks of navigation are so increased, that the question of insurance would in all probability settle the date.

NOTES BY OBSERVERS.

Station No. 1, Port Burwell—Mr. G. Shaw.

November, 1886.

1st. Up to this date there has been no steady snow storm, it falls in short showers and is continually drifting.

10th. Heavy gale to-night; squalls upwards of 65 miles an hour.

17th. Snow does not seem to stay on the land, it is literally blown out to sea, the ravines and hollows filling up level.

19th. Temperature fell below zero to-night for the first time.

December, 1885.

6th. Wind to-day a perfect hurricane.

7th. Brilliant aurora to-night.

15th. I estimate total snowfall at about two feet; it has been perfectly impossible to measure it.

19th. Parhelia visible at 11 a.m.

25th, 26th. Lunar halos. Eskimo visited us on the 25th.

31st. Heavy snow in a.m.

January, 1886.

10th. Heavy gale, but squally.

14th. Brilliant aurora morning and evening; parhelia at 11 a.m.

17th, 18th. Heavy gale; snow drifting.

22nd. Aurora bright at 7 and 11 p.m, Class 4.

23rd, 24th. Heavy gale.

31st. Our first feathered visitor for some time; a raven was flying about the station all day.

February, 1886.

6th. A dark, smoky-colored circle surrounded the sun to-day.

14th, 15th, 16th, 17th. Heavy gale of wind, with scarcely any intermission.

18th. Parhelia in a.m.

28th. Another very heavy gale; wind 70 miles an hour in squalls. The raven has remained with us all this month.

March, 1886.

12th, 13th. Parhelia in a.m. each day.
14th. Lately we have seen quite a number of ravens.
17th. Parhelia at sunrise.
20th. 21st. Brilliant solar halos, with prismatic colors, showing distinctly.
22nd. Parhelia at 9:30 a.m.
23rd. Three ptarmigan seen to-day; this is the first appearance of these birds.
30th. Solar corona at 9 a.m. to-day, brilliant aurora at night.
31st. Snowing and drifting; cleared at night; aurora: Class 3.

April, 1886.

2nd. Heavy gale from 6 p.m. of 1st to 6 p.m. to-day. Wind averaged nearly 60 miles per hour.
15th. Brilliant aurora at 11 p.m.
16th. Solar halo at 11 a.m.
17th. Three heavy showers of rain fell to-day.
25th. Snow birds seen to-day for the first time.
26th. Ptarmigan are now getting plentiful. Saw an owl to-day. Snow melting with the south-east wind.

May, 1886.

1st to 4th. About a foot of fresh snow has fallen this month.
13th. Temperature in the sun by ordinary thermometer 66°, shade temperature 33°.
18th, 19th, 20th. Hail fell on each day.
25th. First sign of sea birds, saw one gull to-day.
28th. Geese passing north in flocks.
31st. First signs of vegetation coming to life; some of the plants are coming up green in sheltered places.

June, 1886.

4th. A very heavy North and N.E. gale and snow storm.
16th, 17th. Brilliant aurora in N. and N.E. Parhelia visible at 7:30 p.m. on 17th.
19th. Very heavy snow from 9:30 p.m of 18th to 3:30 p.m. to-day.
21st. Brilliant aurora in N. and N.E. at 11 p.m.
22nd. The ground is drying up very rapidly.
26th. Solar halo at 4.30 p.m.
30th. Solar halo at 1:30 p.m, very distinct and bright in coloring.

July, 1886.

1st, 2nd. Auroras at 11 p.m. each night.
5th. Thunder storm between 3 and 4 a.m., the first that we have had.
10th. Solar corona at 8 p.m.
15th. Weather very dark and gloomy. Heard distant thunder to-day.
19th. Thermometer in the sun this forenoon showed 79°; shade temperature at the same time 54°.
25th. Easterly gale to-night, wind reaching 45 miles per hour.

August, 1886.

6th. Large numbers of sea birds in the harbor to-day.
7th. Thunder and lightning, but appears to be some distance off.
20th. Heard distant thunder this morning.
28th. Flurries of snow falling again. Tops of the hills are covered.

September, 1886.

7th. Ground is frozen hard this morning.
26th. Fresh water ponds and lakes are frozen over.

ASHE INLET, STATION NO. 3.

Mr. J. W. TYRELL, P.L.S., Observer.

September, 1885.

29th. Two peals of thunder heard to-day; wind blowing 60 miles an hour at 11:30 p.m.

October, 1885.

2nd. Brilliant aurora.
12th. First natives arrived.
17th. Lamps lighted at 4.40 p.m.
22nd. Eleven more Eskimo arrived to-day.

November, 1885.

5th. Tide staff destroyed by ice.
20th. 3 p.m. Observation was taken by lamp light to-day.

December, 1885.

8th. Lamps lighted at 2 p.m.
22nd, 23rd. Lunar halos.

January, 1886.

10th. Five Eskimo arrived, having walked over White Straits on loose ice.
20th. Faint double lunar halo.

February.

11th. 3 a.m. Mercurial thermometers frozen.
16th. Lunar halo visible.
18th. Lunar halo with large bright cross in the centre.
20th. Captain Nipgin, Agent of the R. S. Williams Company visited station to-day. His station is at Spicer Harbor, west of this island.

March, 1886.

3rd. By base line, measured on the harbor ice determined the height of Look Out Point, and the station door sill. The heights obtained are—Look Out. 247 feet, Station door sill 40 feet above M. S. L.
21st. Shot a bear at the door of the station house this morning at 6 o'clock.
22nd. First appearance of ravens.
28th. Brilliant aurora at 11 p.m.

April 1886.

1st. Two snow birds seen for the first time this morning.
3rd. Ptarmigan have returned, first seen this afternoon.
7th. A number of walrus are off the mouth of the harbor to-day.

May 1886.

4th. A number of natives arrived to-day.
14th. First fall of rain.
15th. Heavy rain.
25th. Snow disappearing rapidly.
30th. The two days rain has nearly removed the snow—it has all gone from the highlands.

June, 1886.

6th. Steamer "Arctic" arrived and made fast to the ice at the entrance of the harbor.
9th. Twenty-three Eskimo assisted us in building a beacon on the bluff.
25th. The river which runs into the head of the inlet is rapidly breaking up the ice there.

July, 1886.

11th. "Alert" arrived at 4 a.m.
20th. Heavy swell heaving in from the south.

August, 1886.

28th. Snow fell to-day.

September, 1886.

2nd. Wild geese are flying south in large flocks.
5th. Snow nearly covers the ground
12th. "Alert" arrived; station relieved.

STUPART'S BAY—NOTES BY OBSERVER.

Mr. F. F. Payne.

August, 1885.

22nd. Arrived at Stupart's Bay and took charge of station.
26th. Meteorological and other observations commenced to-day.
29th. A great number of Eskimo about the house begging for food.
30th. Bathed in the sea to-day. All Eskimo left for the deer hunting ground.

September, 1885.

5th. Some specimens of birds, fishes and insects taken to-day.
10th. Eskimo seen collecting large quantities of shell fish.
14th. Eskimo returned from the deer hunt bringing several deer.
15th. The first wintry day.
19th. Ice on small lakes now is a quarter of an inch in thickness.
20th. The D. S. S. "Alert" arrived, homeward bound.
24th. The D. S. S. "Alert" left here to-day.
29th. A strong gale is blowing.

October 1885.

8th. Eskimo seen eating quantities of seaweed.
13th. A great number of Eskimo here to day.
15th. A warm and most enjoyable day. Flies numerous.
21st. A snow wall was built round the house.
25th. Lunar halo seen.
29th. Some Eskimo forcibly attempted to enter the house but were put out without much trouble.

November, 1885.

5th. A bright solar halo seen.
7th. A large seal was shot and given to the Eskimo.
8th. Ice on lakes now measures 1 foot 2 inches.
15th. Some large walrus were seen to-day.
16th. Some fine salmon brought to the station by Eskimo.
19th. Lunar halo seen.
21st. Solar halo seen.
27th. Solar halo was seen.

December, 1885.

3rd. We still continue to draw water from a neighboring spring.
5th. At 12.50 p.m. wind suddenly fell from 45 miles to 8 miles per hour.
12th. Lunar halo at 4 30 p.m.
14th. Ice on lakes measures 22 inches.
15th. Solar halo at 11 a.m.
21st. All fresh water springs are now frozen up.
22nd. Lunar corona at 10:15 p.m.
25th. Christmas Day. Lunar corona seen.
27th. Ice on lakes measures 26 inches.
31st. Solar halo at 10:30 a.m.

January, 1886.

8th. A perfectly clear sky bore a purple color at 3 p. m.
19th. Lunar halo at 11 p.m.
20th. Lunar corona at 11 p.m.
21st. Lunar halo at 11 p.m.
22nd. Lunar halo at 11 p.m.
23rd. Heavy gale.
28th. Eskimo are badly off for food.

February, 1886.

1st. Bright halo and "sun dogs" seen to-day.
3rd. An exciting game of football with the Eskimo.
6th. An Eskimo burglar captured to-day.
9th. Solar halo at 11 a.m.
12th. Lunar halo at 11 p.m.
13th. The sun felt unusually warm to-day.
14th. Some venison was brought to the station by Eskimo.
15th. Lunar halo at 11 p.m.
16th. Solar halo, 3 p.m.; lunar halo, 11 p.m.
17th. Lunar halo 7 p.m. and 11 p.m. Meteor seen at 11:07 p.m. Fell toward S.S.E.
21st. Lunar halo 11 p.m.
22nd. Solar halo 11 a.m.

23rd. At 10 a.m. there was an extraordinary bright red sky to the southward, this was followed by a Class IV aurora in the same position at night. 8:30 a.m. solar halo.

24th. Exactly the same phenomena as noted yesterday was seen to-day.

25th. Red sky at 9:15 a.m.

27th. A heavy gale all day.

March, 1886.

2nd. Solar halo at 3.20 p.m. Dense fog 7 a.m.

3rd. Dense fog.

5th. Red sky at 10.20 a.m., S.S.E. Bright aurora at night. Fog.

10th. Brick-red sky seen at 9 a.m.

20th. Lunar corona at 11 p.m. A number of Eskimo made a most daring burglary upon the storehouse during the night, carrying off a quantity of provisions.

21st. Solar halo at 2.30 p.m.

22nd. Lowest temperature 39°.5 occurred to-day.

26th. Another attempt was made at midnight by the Eskimo to take provisions. The door of the storehouse was smashed, but the thieves were put to flight.

27th. Solar halo at 3 p.m.

28th. Solar halo at 11 a.m.

April, 1886.

1st. Letters sent to Fort Chimo by an Eskimo to-day.

4th. Solar halo 12.15 p.m.

5th. A number of Eskimo starving.

8th. An Eskimo was drowned to-day.

12th. Solar halo at 11 a.m.

13th. Solar halo at 5.40 p.m.

16th. Solar halo at 10.45 a.m.

17th. Ice on lakes measures six feet and half an inch.

27th. Solar halo 7 a.m. to 3 p.m.

30th. Was informed of the existence of an immense lake some miles inland, where many Eskimo live.

May, 1886.

1st. Another attempt to force an entrance into my storehouse by Eskimo during last night was frustrated, a watch being kept day and night.

3rd. Sea water ice in an almost land-locked bay, measures 66 inches.

4th. Eskimo are now leaving for the deer hunting ground. Solar halo at 11 a.m.

5th. Solar halo at 12.05 p.m.

7th. Solar halo at 3 p.m.

8th. Solar halo at 11 a.m.

10th. Four Eskimo found in a dying condition from starvation.

12th. All but those Eskimo reduced to helplessness have left this part of the country.

14th. Lunar corona at 10 p.m.

15th. An Eskimo, though well fed with such food as could be procured for him, died this afternoon.

17th. Solar halo at 7 a.m. Some Eskimo returned bringing venison and reindeer tongues.

21st. Letters received from Fort Chimo.

26th. Peas, turnips, spinach and cress were sown to-day.

June, 1886.

2nd. Buoys were put out near dangerous shoals.

4th. An Eskimo child, saved from death by starvation some time ago, died from exposure to cold to-day.

14th. Solar halo at 7 p.m.

17th. Frost is to be found four feet below the surface of the ground·

18th. Two large seals were shot to-day.

30th. Lightning was seen for the first time to-day.

July, 1886.

1st. Beacon on Signal Hill rebuilt.

2nd. Birds, flowers and insects are now numerous.

3rd. Solar halo, 7 a.m. to 3 p.m.

13th. Harbor opened to-day.

17th. Some fine trout were caught to-day.

August, 1886.

11th. A barque seen a few miles from shore.

12th. Barque is still opposite the station and every means have been used to signal her.

13th. Great disappointment. The barque, unheeding our signals, sailed away this afternoon.

15th. Solar halo at 3 p.m.

16th. Lunar corona at 11 p.m.

23rd. Two very old iron cannon and a ship's anchor were found on the shore to-day.

29th. Extraordinary meteorological phenomena noted to-day, evidently caused by immense bush fires in the heart of Labrador.

30th. Water taken from a stream, after a fall of rain, tasted so strongly of smoke it was unfit to drink.

September 1886.

8th. The surface of the ground is now frozen. Seventy wild geese were shot during the past three days.

10th. Solar halo at 11 a.m.

13th. Solar halo at 7 a.m.

16th. Relief ship "Alert" arrived, and was saluted with one of our cannons.

25th. Abandoned station.

NOTTINGHAM ISLAND.

General Notes at Port De Boucherville, By Mr. John McKenzie.

August, 1885.

24th. Landed.

25th. Pin-tailed ducks numerous in harbor.

26th. Barque seen inward bound. Walrus seen off port.

27th. Temperature of sea, 36°.0. Barque to S.SE.

30th. Flock of geese flying East.

31st. Temperature of sea, 33°.0. Geese, loons, and other water fowl on lakes. Saw one deer.

September, 1885.

2nd. 5 p.m. Beautiful halo—colors distinct.

11th. Large flocks of swans. Butterflies. Walrus at entrance to port, but did not succeed in shooting any.

15th. Numbers of white porpoises to be seen occasionally in the harbor.

16th. Half-inch ice on pools.

18th. "Alert" called homeward bound.

20th. Brooks and lakes frozen over—no geese or swans to be seen. Ptarmigan plentiful—partly white.

23rd. One-quarter inch ice on pools. Thin broken ice on shallow coves. Considerable old snow remaining in places. Tried for trout through the ice on lakes, but was unsuccessful.

26th. Strong gale of wind from west (56 miles)—first appearance of ice. Mean temperature of sea for month, from observations taken, 33°.5; maximum, 38°.0; minimum, 29°.8, A few seals were seen during the month around the shore.

October, 1885.

1st. 5.1 inches ice on ponds. Sheltered bays frozen over, Ptarmigan very plentiful along the flats near the shore. Considerable snow inland; drifts very compact.

3rd. Bay north-west of station frozen over, strong enough to bear seals.

9th. Beautiful solar halo, arcs, with parhelia; colors as distinct as an average rainbow.

14th to 24th (inclusive). What would be called "Indian summer" further south appeared to be well marked. Mean temperature for 11 days 29°.43 only 2°.7 below that for September, 6°·22 above that for the previous 13 days of October, and 6°.39 above that for the whole month with light variable winds and a mean cloudiness of 8.54.

27th. First deer shot.

November, 1885.

1st. Ptarmigan assumed their winter plumage some time ago and have nearly all disappeared.

6th. Ice crystals. Also on 8th quite common.

11th. Lakes and brooks covered with half-melted snow; this was noticeable until late in the month. Tops of hills bare with crevices in rocks full of tightly-packed snow. This was the case all winter.

23rd. Colors of a lunar corona well defined—red, yellow, green and blue.

27th. Fifteen inches of ice on lakes. A mean depth of snow on wide valleys, 9 inches. Tops of hills bare. Reindeer were very numerous during the month. We secured a winter supply of fresh meat. The weather was not at all unpleasant during this month.

December, 1885.

3rd. A raven comes around station for food.

17th. Deer disappeared and were not again seen until the middle of February. Seals were not to be seen for some time on shore ice.

31st. 12 to 17 inches snow on valleys, 20 inches ice on lakes under 8 inches of hard-packed snow. Winter set in, in earnest, early in this month. A few white foxes are the only form of animal life visible; towards the latter end of the month, Parhelia with colours well defined are very frequent in the vapour hanging over the open water to south.

January, 1886.

6th. Brilliant meteor fell from N.E. at 7:51 p.m.

Optical phenomena very common during the month. Nearly every night when clear beautiful auroral displays took place—notably on 19th and 30th. Snowfall very light, but drift severe.

February, 1886.

1st. Hills in the mornings often have a misty appearance.

2nd. 13 inches snow on plains. Some 2 feet or more on rough ice at head of bay.

10th. Saw a couple of reindeer—first since early in December.

11th. Two ravens.

15th. Most severe storm of the season, 70 miles of wind from S.W. Snow on open level ice, is laid in a series of parallel waves or ridges. Deposits of sand, mosses, lichens, &c., found on snowdrifts to leeward of hills from winter storms.

Optical phenomena very frequent during the month.

March, 1886.

12th. For the last fortnight or so on cold and tolerably calm days, in the morning it is fine and clear, but towards noon becomes hazy, followed in the evening by a light fall of snow dust.

30th. In the middle of harbor, far from shore, cracks, &c., and under 5 inches snow (but the amount of the latter was variable during the winter), 61 inches ice; temperature of sea was 29°.0 (Faht.).

Optical phenomena numerous during the month.

April, 1886

1st. Deer have shed their antlers—new ones beginning to grow.

5th. Found shallow lakes frozen to bottom.

7th. First appearance of snow melting in shelter of station, also around ashes and other debris.

13th. First of migratory birds—a small snow bird.

20th. Very light silver thaw last night. Noticed for the first time that the edges of the patches of ice in shallow depressions on the bare rocks facing the south were thawing.

28th. 14 ins. snow on big plain to S.W. of station. Small puddles of water form on the rocks during the day. The weather for most of the month was quite pleasant, but particularly the latter part of it. A few bears seen; we have now secured more deer meat than we can use.

May, 1886.

1st. First appearance of sea birds—mers.

15th and 16th. Big snow storm and gale from N. Snow at its max. depth.

18th. Gulls arrived.

20th. Thousands of eider ducks and loons arrived.

21st. Geese flying north.

26th. Snow melting rapidly. Streams of water running down the sides of rocky hills. 6 ins. of sand on valleys N. of station where snow lodged, thawed out; but under the least sod, only an inch or two. Numbers of seals around cracks on shore ice,

27th. First appearance of insect life. A small fly on mossy corners of the rocks.

31st. Snow very soft with large quantities of water underneath. There are still 15 or 16 ins. on plains and S.W. of station, but that around the hills and on the

ice has melted very much this last week. The blue ice on harbor can now be seen, though still covered with 4 or 5 ins. of water and half melted snow. Ptarmigan are still white, but are losing their feathers; snow birds are now numerous and have changed color a good deal.

The month of May was particularly stormy, at least for the first twenty-five days, and when not actually stormy the sky was overcast and gloomy; mean cloudiness for the month was 9·3. It was the most windy month of the year.

June, 1886.

1st. Flocks of geese are now passing north; the grass is beginning to sprout, but is not over the ground yet, some varieties of moss have become green, and small ponds on top of the rocks, from one to two feet deep are nearly thawed out.

2nd. The Arctic willow is opening its buds.

3rd. Sandpipers seen to-day for the first time.

7th. Small purple flowers are coming into bloom.

10th. Spiders first seen.

14th. The plains are now well clear of snow.

21st. The ice on inland lakes is still two feet or more in thickness; grass has run up in places over two inches. Hawks, all kinds of water fowl, and small birds have nests with eggs in them.

30th. The weather with few exceptions was delightful during the whole month, with but little fog and some light rain. The wind for the most part was light and variable, increasing in velocity during the day, and dying down again during the night. This has been by far the finest month of the year.

July, 1886.

3rd. Harbor ice all broken up.

5th. Twenty-three inches of barren sand has thawed out; under a very light sod frost still present at eighteen inches, and in the wet, peaty valleys the ice can still be felt under foot whilst walking.

8th. Light cumulus clouds were seen over the mainland to the south for the first time to-day.

12th. Some varieties of grass are in blossom.

18th. Peculiar smoky atmosphere with smell of burning peat.

15th, 20th. Mean temperature of sea water 33°.5.

21st. Used lamp to read the thermometers at the 11 p.m. observation for the first time since early in May.

22nd. Young ducks are in the salt water.

27th. Harbor is full of "herring bait;" tried a couple of times for codfish but got none; sculpins and smelts are in the harbor in abundance.

29th. Found ice under 4 inches of moss, in a big valley to S.W. of station.

30th. Sand is thawed out for 27 inches, but under a light sod, only 22 inches.

August, 1886.

12th. A thin coating of ice formed on the harbor last night; temperature of the sea this a.m. 34°.

17th. Total and final disappearance of field ice.

18th. A small piece of a rainbow was seen to-day; this is the first seen since landing.

19th. The first and only thunderstorm occurred to-day.

22nd. Saw a brigantine to S.W. of port at 10 a.m. She put about, some six or seven miles from here at 10.30 a.m.

24th. A number of walrus seen to-day.

26th. Vegetation has for some time assumed its autumn tint. I noticed the leaves of the Arctic willow coloured two weeks ago.

28th. To-day made another unsuccessful attempt to find codfish.

September, 1886.

1st. Temperature of the sea 33°8. Flurries of snow.

2nd. Geese are going south in flocks. Under bare sand 30 inches of soil is thawed, but ice is found at 5 or 6 inches under turf.

7th. Half an inch of ice formed on fresh water ponds.

8th. Station abandoned.

NOTES BY OBSERVERS.

Station No. 6—Port Laperière.—Mr. P. C. Woodworth.

September, 1885.

2nd, 6th. Large flocks of wild geese flying south daily.

7th, 21st. The geese and ducks had all left by the 7th, and from this date to the 21st the gulls remained.

October, 1885.

This was quite a wintry and boisterous month.

November, 1885.

1st. The high winds which we have had lately, seem to have blown away a great deal of snow. The average depth now does not exceed five inches.

8th. Auroral display this evening; commenced by a gradual brightening up of the eastern sky, resembling the dawning of day.

29th. Fresh gale this afternoon and the anemometer broke down.

30th. It is impossible to measure the snowfall, for it blows at once off the rocks on to the harbor ice or out to sea, and that on the harbor ice gets swept out occasionally altogether.

December, 1885.

5th. The snow to-day drifted right into the thermometer shed almost, filling it.

7th. We have to keep constantly cleaning the snow out of the thermometer shed. It seems to drift unceasingly.

16th. Lunar halo at 10:10 p.m.

January, 1886.

10th. A raven was seen flying north to-day, first bird of any kind since Dec. 1st.

5th. Brilliant aurora at 11 p.m.

20th. Snowing to-day, but no matter how much snow falls, it does not seem to increase the quantity on the islands; this remains practically the same, and the snow is blown out to sea.

29th. Parhelia seen to-day at 11 a.m. and 3 p.m.

30th. Parhelia again at 3 p.m.

February, 1886.

5th. Solar halo at 3 p.m. A raven was seen here to-day.
9th. Mercury frozen.
10th. Very distinct solar halo.
14th. Solar halo and parhelia.
17th. Lunar halo and very distinct parselenae.

March, 1886.

5th. Got a freshly-killed deer from the Eskimo here to-day. This is the first we have got, and was shot on or near this island.

8th. Double solar halo at 3 p.m. to-day.

9th. Ptarmigan arrived to-day. Shot two, and found what I thought was green spruce buds in their crops.

13th. A peculiar optical phenomenon was noticed to-day at 3 a.m. The moon being about 10° above the horizon a pillar of bright copper-coloured matter appeared resting upon the horizon and extending upwards about 18° to 20°. It passed right through the moon's centre, and its breadth was a little less than the moon's diameter.

17th. Large lunar halo.

30th. Two ravens were seen to day.

April, 1886.

5th. Ducks seen to-day for the first time. They all seem to be flying northward.

6th. Hard hail falling at 11 p.m., with the stars clearly visible at the same time.

9th. First snowbird seen to-day.

16th. Hail falling nearly all day.

25th. More ducks flying north at 11 p.m. to-night.

27th. Saw a Polar bear and two small cubs to-day. Also saw some gulls for the first time this year.

28th. Animal life begins to show abundantly. Numerous walrus, seals and flocks of sea birds are to be seen out in the Straits.

30th. Saw a flock of ptarmigan at 10 a.m. to-day.

May, 1886.

2nd. Enormous flights of ducks seen out in the Bay to-day.

3rd, 4th and 5th. The most stormy weather since my arrival at the station last August.

7th. Saw a large right whale to-day.

15th, 16th. Heavy gales and snow storms; average velocity of the wind forty miles an hour, taking miles run by the anemometer.

17th. Large flocks of loons passing north.

21st. First shower of rain at 8.30 a.m. to-day.

27th. Saw some wild geese to-day flying north.

29th. More geese going north, one flock of white waveys, and another seen at a distance are, I think, the grey Canada goose.

June, 1886.

9th. Saw a swan to-day, this is the first that has been seen this year.

10th. Eskimo came over from the mainland in their kayaks to-day.

23rd. Ice looked so loose to-day that I think a steamship could have made her way through.

July, 1886.

19th. Saw a steamer in the offing to-day.
20th. "Alert" arrived.
27th. Saw a large barque rigged vessel out in the Straits, working S.W.
28th. Eskimo arrived here to-day in their kayaks.

August, 1886.

2nd. Two Eskimo arrived to-day.
5th. Heard the wash of the sea to-day.
22nd. Shot three bears to-day, they were swimming in the harbour.
23rd. Saw a small brigantine about five miles off the Beacon Light.
26th. A large flock of geese flying south to-day at 3 p.m.
29th. Dense smoke and fog, intense darkness at night, with heavy rain on the morning of the 30th. The rain water was tainted and discoloured.
30th. Dominion Steamship "Alert" arrived.
31st. Station closed.

FORT CHURCHILL.

OBSERVER—MR. JOHN R. SPENCER.

August, 1885.

31st. Snow storm.

September, 1885.

19th. Frost recorded.
23rd. Thermometer 29° at 10 p.m.
24th. Ice forming.

October, 1885.

1st. Severe snow storm with easterly gale.
16th. Thunder storm during the night.
28th. Thermometer fell below zero.

November, 1885.

3rd. River frozen over below Mosquito Point.
13th. Raining at the Old Fort, 4 miles north.

December, 1885.

4th. River frozen over.
18th. Brilliant meteor at 7.40 a.m.

January, 1886.

19th. Mercury frozen.

Februarg, 1886.

12th. Very deep snow.

March, 1886.

24th. Snow birds have returned.

April, 1886.

5th. Snow is heaped in mountains round the fort.
15th. First shower of rain. Glazed frost.
22nd. First goose seen going north.

May, 1886.

4th. The weather has been very bad and peculiarly stormy for the season.

June, 1886.

10th. River open up at Mosquito Point.
15th. Snowing.
17th. River open to the mouth.
22nd. First thunderstorm. Temperature 70°.
27th. Thunderstorm. High winds.
29th. Thunderstorm, with large hail.

July, 1886.

4th, 5th, 11th. Thunderstorms.
11th. Dense smoke.
18th, 23rd. Thunderstorms.
29th. "Alert" arrived.

August, 1886.

4th, 10th. Thunderstorms.

NOTES BY OBSERVERS.

STATION, BELLE ISLE ISLAND LIGHTHOUSE.—OBSERVER MR. COLTON.

November, 1885.

4th. Fresh gale; wet snow and fog.
10th. Fresh gale; hail and heavy rain.
24th. Newfoundland steamer, bound south, was the last vessel seen.

December, 1885.

4th. Fresh gale from north, with snow.
8th. Strong gale and dark, gloomy weather.
28th. Fresh gale with heavy rain; temperature fell 49° in twenty-four hours.

January, 1886.

6th. Gale from east, with heavy rain.
15th. Strong gale; landing wharf carried away; and the spray is frozen 100 feet above high water mark.

March, 1886.

1st. Strong gale, with squalls of wet snow.
4th. 4 p.m., fog bow from N.E. to E.S.E.
9th. Large quantities of heavy ice and 200 icebergs in the Straits.

April, 1886.

4th. First sealing steamer seen to the south.

May, 1886.

1st. Heavy jam of Arctic ice in the Straits.
15th. Straits still full of ice.
24th. Straits clear of ice.

June, 1886.

10th. 1 a.m. Thermometer 32°.
16th. Hoar frost.
28th. Mid-day thermometer 35°.

July, 1886.

2nd, 7 p.m. Sudden shift of wind to north, with heavy squalls and rain; 8 p.m., blowing a heavy gale; sea white with foam and heavy rain; 5·09 inches of rain fell up to 6 a.m. of the 3rd.

7th. Strong breeze and dense fog. "Scotswood," of St. Johns, a total wreck.
28th. Strong breeze and thick, wet fog.

August, 1886.

4th. Strong gale and heavy rain.
14th. Frost during the night.

NOTES BY OBSERVERS AT YORK FACTORY.

1846.

March 9th. Began hay hauling.
16th. Began cutting schooner out.
April 4th. Raining.
11th. Finished hauling wood.
May 1st. First goose killed.
5th. River began breaking up.
7th. River full of broken ice.
June 8th. Mosquitoes numerous.
July 26th. Thunder storm.
September 18th. Snowing.
19th. Ship left for England.
October 15th. River full of ice.
November 25. River fast.

1847.

April 24th. Rain.
May 9th. First goose killed.
June 2nd. Ice in river broke up.
12th. Snowing.
24th. Thunder.
July 7th. Thermometer read 90.5°
August 25th. Ship arrived.
September 2nd. First snow.
November 15th. River fast at Fort.

1848.

May 21st. River broke up.
28th. Raining.
June 22nd. Heavy snow storm.
28th. First thunder.
September 8th. Snowing.
9th. Frost.
October 26th. Raining.

1849.

April 1st. Snow birds seen.
May 5th. First goose seen.
6th. First rain.
18th. River breaking up.
June 4th. Last snow.
August 15th. Ship arrived.
17th. Thunder storm.
September 27th. Snow showers.
October 30th. First ice on river.
November 9th. No ice on river.
15th. Last rain.
26th. River set fast.

1842.

Sept. 8th. Frost this morning. Temperature 8 a.m., 29°.5.
15th. Ship left.
20th. Snowing.
October 18th. Ice in river.
November 5th. River nearly clear of ice.
11th. River set fast.

1843.

April 6th. First rain.
May 22nd. River commenced breaking up.
29th. River ice broken up.
June 14th. Snow.
19th. Frost.
23rd. First thunder storm.
July 16th. Heavy thunder storm, beacon struck by lightning.
19th. One canoe with three passengers started.
August 19th. Haying finished. Twenty-two boats start for fishing.
September 17th. Snow showers.
October 7th. North goose boats arrived.
19th. River full of ice.
November 11th. River set fast.

1844.

April 1st. First thunder.
11th. Lightning, thunder and hail.
May 13th. River began breaking up.
14th. Choked with ice.
20th. River clear below old factory.
30th and 31st. Snowing all day.
June 8th. Snowing all day.
9th. Light snow.
July 2nd. Snow.
September 14th. Ship started.
19th. Frost.
October 15th. Snowing.

1845.

April 11th. Raining.
May 9th. First goose seen.
22nd. River opposite Fort broke up.
June 14th. Snowing.
26th. First thunder.
August 31st. Light snow.
September 11th. Ship left for England.
November 24th. River set fast.

1850.

May 13th. First goose seen.
14th. First rain.
27th. Last snow.
28th. River breaking up.
June 1st. River clear.
21st. Thunder storm.
July 31st. Hay stacks made.
August 8th. Ship arrived.
September 26th. First snow.
October 22nd. Last rain.
27th. River full of ice.
November 28th. River set fast.

1851.

May 5th. First goose seen.
21st. River broke up.
June 9th. Last snow.
18th. Rain.
August 9th. Hay stacks built.
12th. Ship arrived.
September 9th. Ship starts.
October 8th. Last rain.
14th. First snow.
December 10th. River set fast.

1852.

April 30th. First goose killed.
May 9th. First rain.
17th. River broke up.

1852

June 7th. Last snow.
July 14th. Thunder storm.
August 15th. Ship arrived.
September 7th. Finished hay making.
12th. First snow.
16th. Ship started.
October 17th. River full of ice.
November 8th. River fast.

1853.

May 12th. First rain.
26th. River breaking up.
30th. River clear.
June 14th. First thunder.
22nd. Last snow.
September 11th. Ship started.
12th. First snow.
October 23rd. Ice in river.
November 9th. River fast.

1854.

April 17th. First rain.
May 9th. River began breaking up.
20th. Last snow.
23rd. River clear.

THE RESOURCES OF HUDSON BAY AND STRAIT.

THE FISHERIES.

Having now completed my third voyage to Hudson's Bay, I desire to draw your attention to the value of the fisheries in that part of the Dominion of Canada. The Government of Newfoundland exercises jurisdiction over that part of the Labrador which lies to the eastward of a line joining Cape Chidley with the mouth of the river running into Blanc Sablon Bay, in the Straits of Belle Isle; to the west of this line lies all the coast line of Ungava Bay, Hudson's Straits and Bay.

The fish and mammals possessing commercial value in these waters are the right whale, the white whale, the uni or narwhal, the porpoise, seals of several kinds, the walrus, and the polar bear; of the fish, salmon and trout only are at present exported, although a very fine species of white fish is found in the Nelson River.

The whale fishing in Hudson's Bay has for many years past been actively prosecuted by citizens of the United States, chiefly from the ports of New Bedford, Mass., and New London, Conn. The voyage is generally made in comparatively small sailing vessels and occupies about eighteen months; leaving their New England port early in June of each year they make the best of their way to Marble Island in the north-west of Hudson's Bay, generally arriving some time in September, and going into winter quarters in the outer harbour there. As many as four ships have wintered together at this place, and the long row of graves on Deadman's Island bears strong but silent testimony to the trials and hardship, that these men undergo in the pursuit of their calling. After spending the winter in harbour here, the ships are sawn out of the ice early in June, and cruise about the Hudsons Bay till the latter part of July or beginning of August, they then go up Rowes' Welcome and generally return leaving the Bay for home early in September.

That the pursuit of the whale fishing has been fairly profitable may be presumed from the fact that the shrewd citizens of New England continue to prosecute it.

In the winter of 1885-86 two vessels belonging to New Bedford, Mass., wintered at Marble Island. This winter 1886-87 two vessels are in the Bay, and I am informed that two more are now fitting for the fishing there to sail from New London early in June.

The following is a table showing the number of ships sent by the New Englanders to Hudson's Bay and Cumberland Gulf, in each year from 1846 to 1876, with their catch :—

TABLE showing number of United States Vessels sent to the Whale Fishery of Hudson's Bay and Cumberland Gulf.

Year.	Number of Ships.	Total Tonnage.	Catch.		
			Sperm.	Whale Oil.	Bone.
			Brls.	Brls.	Lbs.
1846	1	376	....	140	....
1847	1	376	....	1,111	15,000
1849	1	376	....	600	12,000
1850	1	376	....	450	7,000
1851	1	376	....	258	4,900
1853	2	281	....	1,259	24,000
1855	2	491	....	184	....
1856	2	394	....	606	2,200
1857	2	281	....	710	12,200
1858	2	526	50	2,163	33,000
1860	10	3,449	50	2,160	126,800
1861	2	853	70	2,795	43,900
1862	5	1,397	38	3,755	64,280
1863	9	2,501	368	4,046	64,150
1864	17	3,896	365	9,146	147,145
1865	5	1,324	37	3,782	62,000
1866	16	2,601	95	5,316	90,800
1867	5	992	10	2,276	32,589
1868	8	1,201	237	2,893	36,395
1869	5	820	220	2,523	36,305
1870	3	509	....	1,765	27,040
1871	5	1,123	20	443	5,100
1872	3	380	....	1,058	16,259
1874	3	665	60	1,950	28,000
1875	2	485	....	630	9,000
	113	....	1,620	56,019	900,063
Average, 25 years	4 or 5 ships per year.	Average per ship.	14·3	496	7,965

(From Petermann's Mitteilungen explorations of D. F. Boas).

In the period 1846-76 sixteen ships engaged in the trade were lost, but if we take the above catch and consider that the average size of the ships is only 240 tons the margin for profit is still very large.

Looking at these cargoes with the prices obtainable to-day the fishery is a most valuable one.

This average cargo yields to-day :—

2 tons sperm..	$ 400 00
62 tons whale oil..	6,800 00
$3\frac{3}{4}$ tons bone, say	40,000 00
	$47,220 00

Besides the legitimate pursuit of whales, each one of these ships is an unlicensed trader, competing with the Hudson's Bay Company for the trade with the natives. The Hudson's Bay Company pay the full duty called for by the Canadian Protective Tariff on all the articles imported by them for the trade of Hudson's Bay region.

The duty on the ships invoices for 1885 amounted to twenty-two thousand dollars, paid at York and Moose, thus forming a direct tax on their trade with the natives. It appears unjust that the company should pay this very considerable sum to the Canadian Treasury, and then have to compete against these unlicensed traders, who are exchanging tobacco and occasionally alcohol, from the bonded stores of the New England States, for the furs which would otherwise fall into the hands of the Hudson's Bay people. In order to compete for this traffic the Hudson's Bay Company now send a squadron of boats, up the west coast of Hudson's Bay nearly to Chesterfield Inlet, and they have established regular trysting places, with the natives who each spring bring in their products of musk ox robes, otter skins, blubber, ivory and seal and walrus skins.

But these enterprising whaling captains not content with the trade they can make from their vessels have established regular trading stations on the north shore of Hudson's Straits and in the Frobisher Bay and Cumberland Gulf. At the station in Hudson's Strait the staff consisted of Capt. Nipgin and four other white men—they are the representatives of the well known whaling firm of C. A. Williams & Co., of New London, Conn. They have several complete whale boats thoroughly equipped, and have trained the Eskimo of the district until they have now become quite expert as both oarsmen, harpooneers and boat steerers. Three boats crews of Eskimo are thus employed by Capt. Nipgin; they are stationed at points on the coast some little distance from each other and are thus in a position to follow any whale which may come into the open water, that shows here in the beginning of May, when the ice is driven off the land by the wind. Their watch is kept up all through May, June and July, from the time the ice first begins to open until it has all gone.

For the last three years they have not succeeded in capturing any whales at this station, but the expenses are small, and the capture of a single right whale once in three years, added to the profits which must accrue from the trade done with the Eskimos would make the venture at this station a financial success. The station is visited each year by the relieving vessel called the "Era," though the station hands remain at their posts for two or three years. The "Era" also visits the other stations in Cumberland Gulf, returning to New London in October each year.

The SS. "Arctic," of Dundee, went in this year to fish in Hudson's Bay, and, as stated in the preceding pages, went up Rowes' Welcome to Repulse Bay. One of the Dundee newspapers, of date 5th November, 1886, publishes the results of the year's fishing by the whaling fleet; in it we find the "Arctic" credited with 11,000 seals on first trip, 600 old seals second trip, 2 right whales. The latter yielded no less than two tons of whalebone, and at the end of the article it is stated that sellers were holding out for $12,500 per ton; it will be seen that from whalebone alone the "Arctic's" northern voyage was worth $25,000.

The right whale (*Balaena Mysticetus*) is, in consequence of the high price of whalebone, by far the richest prize which the whaler can capture, and it is unquestionably true that of late years their numbers have been sadly diminished. To such an extent is this the case that no new ships are at present being built for the trade, notwithstanding the fact that four, viz., the "Resolute," the "Jan Mayen," the "Triune" and the "Star" were lost during the season of 1886. The sailing brig-rigged whaler "Catherine," of Peterhead, was also lost last season, and I am thankful to be able to add, that in no one of the above five cases of wreck, was there a single life lost.

Twenty years ago the Dundee fleet used to load regularly in Cumberland Gulf or the southern part of Davis' Straits, but now they have to follow the ice, sometimes going right down through Lancaster Sound into the Gulf of Boothia, and many of them even then return *clean*, or with but partially paying loads. In Hudson's Bay and Straits we only saw two or three whales this year. But several were seen at the

different stations, and it is to be feared that unless some system of protection is adopted this valuable marine mammal may become extinct.

Before concluding this section I would state for your information a few facts in regard to this the most valuable of all marine mammals. In size they vary very greatly, and different individuals yield, irrespective of size or age, the most different amounts of oil and bone. What whalers call a good "pay fish" would run from 50 to 60 feet in length, and the size bone, *i. e*, the central laminae in the mouth must be up to 12 feet in length. Such a one would yield upwards of a ton of bone, and might, according to his condition, give anything from 20 to 40 tons of oil, the blubber varying in thickness in the individual specimens from six to eighteen inches. A fish of this description would, at present prices of oil and bone, be worth about $18,000. The question has frequently been asked me as to what use the whalebone is put which gives it the great value it has. Much of it, especially the long bone, is worked into the better class of silks to stiffen the fabric, and on this account alone, as the demand considerably exceeds the supply, thus keeping the price at its present figure.

The bottle-nose whale is a comparatively small animal, reckoned to average a ton of oil apiece. They are seen in large numbers off the edge of the ice pack, at the mouth of Hudson's Straits in June and July.

The White-whale (Beluga Catodon), is, beyond all question, the whale of the Hudson Bay. On the Churchill River, the York and Nelson Rivers, they go up with the tide each day in great numbers; they were also seen at the stations in the Straits, At Churchill, the Hudson Bay Company prosecute this fishery by means of trap nets as described in former reports. The fishery there was very successful this year, so much so that they had to take the nets up though the whales were still present in great numbers, as they had already filled every available package with oil. The skin of this animal is also valuable, fetching from $7 to $10 each, and as each whale will average about 40 gallons of oil, they are worth from $20 to $25 each. I was much struck when surveying the channel on the Nelson River, by the almost incredible number of these animals which were passing up and down the estuary; they were quite tame, occasionally bobbing up and blowing, within twenty or thirty feet of the boat. The Indians employed by the Company here, drive a row of stakes into the mud at low water, and then sitting on their little platforms, which are built out on the flats by themselves, of four posts and a board, they shoot the whales as they come up, the carcase sinks and taking against the row of stakes is grappled for and buoyed and anchored at low tide. As soon as a load is secured, the large blubber boat is sent round which brings the carcases to the factory, when they are flenched and the blubber tried out, the skins cured, and the carcase put by, for the food of the dog trains in the winter. The use of the rifle as a method of capture is, in my opinion, very wasteful, for many of the carcases are lost or only cast up on the beach, when putrefaction sets in to such an extent as to render it valueless, unless for wolf-bait. I believe that these animals can be profitably hunted and at small cost, at many places in Hudson Bay. One of the whaling captains has told me of their being seen in Frobisher Bay, in thousands, but it would be difficult to imagine them more numerous than I have seen them in the Nelson River.

At Little Whale River the Hudson Bay Company formerly carried on an extensive fishery, but lately, owing, I am informed, to the silting up of the channel, at the mouth of the river, the whales pass by to the northward, without going into the harbour there.

At Ungava (Fort Chimo) large numbers of these animals are also secured, and altogether this fishing cannot be regarded as other than a considerable source of profit to the Hudson Bay Company.

The Unie or narwhal (*Monodon Monoceros*). Very few of these animals were seen in Hudson Straits; they are a good blubber whale for their size, and the horn of the male is valuable as ivory. I have generally seen them in schools of four or five, though the whalers in Davis' Straits report much larger numbers together,

The walrus (*Trichechus Rosmarus*). This animal is found in very considerable

numbers in both Bay and Straits. Its commercial value is high; the skin, when green salted, fetching sometimes as much as twenty cents per pound, and as a fair sized walrus would yield 400 lbs of hide, at say twelve cents per lb., the hide is worth about forty-eight dollars ; they also yield from three to five hundred weight of blubber, of second rate quality, as it is full of fibrous tissue, and thus yields proportionally less oil ; the ivory tusks are worth about one dollar per pound, selected, and taking all kinds together about seventy-five cents per lb. I estimate that one of these animals of average size will yield between sixty and seventy dollars worth of merchantable products. The Eskimo of Hudson Straits continually attack and kill these animals, though, rarely if ever doing so, single-handed. As a rule, the hunt proceeds as follows :—The quarry, having been observed lying basking in the sun, upon the ice, which is passing by with the tide, the hunters start in pursuit, each in his kayak, armed with lances, harpoons and guns ; to each harpoon barb is attached about 30 or 40 feet of stout hide line, to the other end of which is attached the bladder, consisting of the skin of a seal blown full of air ; stealthily approaching their prey, the hunters throw their harpoons, and one or two barbs as a rule will get fast, the wounded animal at once takes to the water, but has now to carry down with him as he dives, one or two of these large bladders. Confused and irritated with the pain, he swims hither and thither, sometimes charging his pursuers, who adroitly keep clear, and launch in additional spears or harpoons, only using their guns when they are sure to take effect—almost the only vital spot is about two inches or rather more behind the eye, about the base of the skull, a bullet near this spot administering the *coup de grace.* When the walrus is dead great rejoicing is held in the Eskimo camp, as his capture insures immunity from starvation for some time. The heart of this animal cooked and dressed as an ordinary beef heart was by no means an uncommon dish on the " Alerts " cabin table, and was a welcome change from the routine dishes of salt pork at one end of the table, and salt beef at the other, which, with salt cod on Fridays, formed the staple of our meals.

International agreement, having the force of law, has already, in the case of seals, restricted the season during which they may be taken, and I think it would be eminently wise to continue to legislate still further in this direction for the protection of these their bigger brethren, and also for the cetaceans.

The walrus is never seen far from shore, and in thick weather the sight of two or three walrus (I do not think I have ever seen one by itself) should be warning to run the lead down at once and keep a bright look-out for the land. In a paper on the seals of Greenland by R. Brown, published in the instructions for the Arctic expedition, 1875, by the British Admiralty, the writer, after discussing the geographical distribution of the walrus and pointing out how, by the incessant pursuit of man, they have been driven from the Gulf of St. Lawrence and other southern haunts to the Arctic regions, states as follows: "It is not now found in such numbers as it once was; and no reasonable man who sees the slaughter to which it is subjected in Spitzbergen and elsewhere can doubt that its days are numbered. It has already become extinct where it was once common. Its utter extinction is a foregone conclusion."

Seals.—Nearly all the families of seals seem to be represented in Hudson's Bay and Straits, but they are never reported, either by our observers or the natives, as having been seen in large packs, such as are met with off the Newfoundland coast in the spring of the year. A large number are, however, killed, and they form, for a very considerable portion of the year, the diet of the Eskimo ; at all times their skins are their clothing and are also used for covering their kayaks and making tents.

Almost the only way in which these animals could, in the Straits, be made tributary to commerce would be by establishing stations at points on the south side and furnishing the natives with barrels or tanks for storing the blubber and with salt for keeping the skins green. A good deal of both oil and hide could be collected in this way, and if the Eskimos knew that a ship would call regularly for their produce at these stations they would retain all their furs which they now have to carry hundreds of miles to the Hudson's Bay posts at Whale River or Ungava.

The fishes exported from Hudson's Straits and Bay are salmon and salmon-trout. The codfish does not appear to go west beyond the eastern side of Ungava Bay.

The salmon fishery is at present only prosecuted by the Hudson's Bay Company in Ungava Bay. Up to this year, large quantities of salmon caught in the rivers flowing into Ungava Bay have been sent home fresh, in the company's refrigerator steamship "Diana." I am informed that they now find it more profitable to export the salted salmon, and that they have this year done so. I was also informed that it was the intention of the company to extend this branch of their trade. Other rivers flowing into Hudson's Straits at the south side, have large quantities of salmon in them, and for the quality of the fish I can vouch, as I have never tasted finer salmon than those we got freshly killed by the Eskimo at Stupart's Bay.

The Hudson Bay Company are the only people who are at present engaged in the salmon trade, and the following statement shows how difficult it is to break their monopoly. A glance at the chart of Hudson's Straits shows that Ungava Bay forms a deep pocket on the south-east side of the Straits, and, as the current on the south side of the Straits flows east, and in July the prevailing winds are from the northward, we should expect, and our experience shows, that the ice remains in this bay for some time after a channel is clearly open in Hudson Straits; thus, we find the Hudson Bay Company's steamer "Labrador" fast in the ice for some days here in the latter part of August, and the report of the Hudson Bay people, with whom I have discussed this question, is that it is no use trying to get into the bay until the beginning of August at the earliest. Such a condition of affairs shuts out the competition of the Newfoundland schooners, whose hardy crews follow the cod fish to the Ultima Thule of Cape Chidley. One or two schooners have passed through the Button Passage, south of Cape Chidley, into the Bay, and have got a few salmon, but none have ever got a paying load, because they cannot get in early enough in the season.

Trade.—The trade of Hudson's Bay and Straits region should be called barter, for it consists in the direct exchange of commodities; in considering the value of this trade, the temper and character of the natives is a most important element. I cannot enter at all into the particulars of the fur trade, the secrets of which nothing short of a railway will lay open; my experience with Hudson's Bay officials being that no matter how talkative, hospitable, or genial the official may be, the question, for instance, of whether otters were getting scarce, always elicits the same reply, Oh! very scarce, very scarce indeed; there is no profit at this post, it is kept up for the Indians. I have never met an official who admitted that his post was run at a profit to the company; so one must, taking them at their words, believe that the company is a huge philanthropic and patriotic institution, contributing upwards of $20,000 a year to the Canadian Government, for the privilege of feeding the non-treaty Indians of Hudson's Bay. Of the character of the Indians, I can say nothing from my own personal experience with them, but of the Eskimo, especially of those who have had but little intercourse with their white brethren, I have the highest opinion, both of their capabilities for development and of the natural goodness of their dispositions. Whilst perfectly fearless in the chase, they are not quarrelsome with each other. There are, of course, bad characters, such as thieves, and sulky, lazy men among them, but the great majority are a docile, friendly people, gratified immensely by a word of kindness, but sufficiently like their white brethren in mental calibre to appreciate the word, more highly, when accompanied by its tangible companion, the gift, which in this case generally takes the form of a clay pipe or the half of a small plug of tobacco. I have always found them willing to work and the best proof of their usefulness is in the fact that the Williams' Company have, as already stated, three organized whale boats crews, who go every spring to the station and fish during the season. From all the information I can gather I do not think that the number of these people in the Hudson's Straits region can exceed 1,500 of all ages and sexes, but this estimate is but little more than a guess, for their system of counting which generally runs one, two, three, a great many, makes it difficult to get from them any idea of the numbers of other bands. They seem to suffer considerably

from lung diseases, the amount of coughing, which I heard once in a group of these poor people, struck me quite painfully as but the natural result of the hardship of their lives. They are very chary of speaking of their religious superstitions or beliefs, and I have myself never being able to obtain their confidence. Mr. Tyrell, who was the observer at North Bluff during 1885-86, learned to speak their language with considerable fluency, and some of them discussed with him their religious beliefs; he tells me that they believe in a future state and in a good Spirit, but also in a great many evil ones. They have also superstitions in regard to the killing of certain animals which occasionally interferes with their work. Mr. Payne, at Stupart's Bay, found that after killing a walrus few of them would do anything for three days. There is no question in my mind but that the trade with these Eskimo can be greatly developed by the establishment of stations at certain points and by letting them know for certain that a vessel would call each year and give them goods for their pelts.

At present the entire trade of the region, over which Canada has jurisdiction, is in the hands of the Hudson's Bay Company and the American whaling companies.

The right of Canada to regulate the fishing and trade of Hudson's Bay and Straits, is, I think, unquestioned, and it seems somewhat one-sided, considering our relations with United States fishermen, that we should continue to allow them to frequent the Bay and compete with foreign duty-free goods against the Company which pays heavy duties to our Treasury on all the articles imported for their trade.

It should be further insisted on, that we have the right to regulate the method to be pursued in the capture of the whales, and to exclude the explosive bomb lance from the list of weapons which may be used.

Experience shows that whales are timid and rapidly desert good breeding grounds when much hunted. They, like the walrus, have been driven from the Gulf of St. Lawrence, and are year by year becoming reduced in numbers and driven farther into the ice-bound refuges of the Arctic Archipelago. The Gulf of Boothia is now their last home and it is rendered comparatively safe, from the difficulties and dangers attendant on a voyage. Captain Guy, of the "Arctic," had intended going from the Rowes' Welcome to Fox Channel and thence to the Gulf of Boothia, but found the Frozen Straits (Middleton), solidly iced in, all summer, and hence it may be said that it would be difficult in the extreme, if not impossible, for a ship to pass from Hudson's Bay and Fox Channel to the Gulf of Boothia; but though there be no means of communication for steam vessels there is no difficulty in the way of the whale, whose powers of subaquatic existence are great, passing from the one place to the other.

I am of opinion that the right whale is being hunted out of Hudson's Bay as he has been from his other southern haunts, and that, not by our own people, or by the fellow subjects of the British Crown, but by the citizens of a foreign though neighbouring State.

It is also worthy of remark that up to this time no Canadian has derived any profit from the development of the resources of Hudson's Bay, save those few who may happen to be shareholders in the Honourable Hudson's Bay Company.

In a previous report I drew attention to the fact that the Colony of Newfoundland collects the duty on articles consumed in that portion of Labrabor subject to the Dominion of Canada. Fort Chimo is clearly within the limits of the Dominion and is the distributing point for some other stations, yet the duty on the whole of the supply ship's invoice, is collected by the Newfoundland Government, the Company deriving the benefit of the difference, between the Newfoundland tariff and our own.

I would respectfully submit the following suggestions in reference to the matter of the trade and fisheries of the Hudson's Bay and Straits region :—

First. That you should consider whether, in view of the value of the whale fishery, and its present condition in Hudson's Bay, it would not be well to close altogether for a stated time, say five years, the whale fishing in these, the terrritorial waters of Canada.

Second. That if foreigners are to be permitted to prosecute the whale fishery and to trade with the natives, a heavy license should be charged for the privilege, and the use of explosive bomb lances prohibited.

Third. That, as in other parts of Canada, a rental should be charged for the the exclusive use of salmon river.

Fourth. That the duties which I am informed are now collected by the Newfoundland Government on goods for consumption in Canada should be paid over to the Canadian Government.

Fifth. That any station established at points on this Strait for purpose of trade &c., should be compelled to pay full duties as *called for under the Tariff.*

If these suggestions are carried out the revenue derivable would, I am sure, go a long way towards paying the costs of maintaining a Government vessel in these waters during the season.

I have dwelt somewhat fully upon the fishery and trade resources of this region, because I am convinced that properly managed they will, irrespective of the question of the development by railway communication, be a source of wealth to our citizens.

Of the mineral resources, Dr. Bell, of the Geological Survey, has already fully dealt; he also contributes a chapter to this report, somewhat further elucidating the subject.

Samples of some economic minerals were brought in at some of the stations by the Eskimo; at Ash Inlet, fine white mica in fairly large sized sheets and pure foliated graphite were brought in. I would also draw attention to Dr. Bell's strongly expressed opinion that judging from the information we have already obtained, he regards the north-west of Hudson's Bay as one of the most promising in valuable economic minerals of the yet unexplored Territories.

METEOROLOGICAL OBSERVATIONS.

The scheme of meteorological observations for the stations in Hudson's Straits has been continued unchanged, all the instruments used were such as are issued to stations in connection with our Dominion Meteorological Service. The station at Nachvak Bay (Skynner's Cove) having been discontinued, the observations taken at Fort Chimo to a certain extent take the place of those formerly taken by Mr. Skynner. At York Factory we have through some incomprehensible miscarriage of the mails, from that post, lost for the second time the observations from that point.

In the observations as published with this report all the instrumental corrections have been applied and the corrected readings of the barometer have been reduced to sea level.

The exposure of the anemometers are all inferior and I am of opinion that the actual velocities out in the Straits would, on the average, be fully twenty-five per cent. greater than those here recorded.

The thermometers, at all the stations in the Straits, were exposed in the regulation Meteorological Service shelter. This consists of an outer shed or case having Louvre sides and door, and a double roof, with an air space open at the sides. The bottom of the shed is of large mesh (2 in.) wire net, and the back of close half inch board.

The inner screen is covered on all sides with thin slats of sheet iron. The whole shelter is attached to the north side of a close board double fence, having a free air space of four inches between the two sides of the fence and also between the north side of the fence and the back of the outer shed. This form of shelter, when the fence to which it is attached is erected in some open space clear of surrounding objects, is as nearly a perfect exposure as is obtainable, but in Hudson's Straits on many occasions the readings of the thermometer were affected more or less by the sheds being drifted full of snow.

Table I is a general table for the station at Belle Isle Island Lighthouse. Observer, Mr. Colton. This is one of the regular stations in connection with the Meteorological Service of the Dominion, and the observations were taken at 3h., 7h., 11h. of the standard time of the 75th meridian. Correct time is obtained from a sun dial, of the pattern constructed by this office for outlying stations, which was adjusted by Mr. Stupart, Inspector of the Meteorological Service, when the station was last visited in 1883.

In the series of observations there are a few breaks of short duration—3 days in October, 1885; 1 day in April, 1886; 4 days in May; 2 in July, and 7 days in August; and though it is much to be regretted that these have occured, I do not consider that the value of the series has been greatly affected.

A comparison of this table, with the results of last year shows that the mean temperature of the year has remained practically unchanged, although the distribution in the months has been considerably altered. The increased amount of stormy weather in the season 1885-86 is shown by the increased average velocity of the wind, the increased cloudiness, and additional rainfall. The number of days of fog has also risen from 113 to 136, the latter number being average also of the twelve years observations—1872-83. The fogs of this region have long been noted, but it is a formidable indictment against this channel to state that on the average of twelve years, in the months of June, July, August and September the foggy weather is one-half of the whole.

Table II gives the abstract of results of observations taken at Port Burwell. The observations at this and all the other stations consist of a series of six observations per day, taken at equal intervals of four hours each, the observation hours being 3h., 7h., 11h., a.m. and p.m., of the standard time of the 75th meridian. This station is in latitude 60° 24′ and longitude 64° 46′ W., approximate. The height of the barometer above mean sea level was 30 feet. The site of the thermometer shed at this station was about 40 feet east of the house, and about the same distance from the edge of the cliff; to the south west of this was a small hill, 26 feet high, and about 60 feet off. The height of the ground at the thermometer shed above mean sea level was 27 feet. The hill to the South West cut off a good deal of sun, especially during the winter months. The anemometer exposure was poor between north west and south west, and from the other points of the compass only fair. Notwithstanding this, velocities of 80 miles per hour were occasionally recorded; and both Messrs. Burwell and Shaw, in their remarks, speak of the almost hurricane violence to which the wind sometimes attained.

Table III is the abstract of observations at Ashe Inlet.—J. W. Tyrell, D.L.S., observer. This station is situated on the shores of an inlet of the strait, and is on the large island, which lies to the south of what has been called on the charts, North Bay, but which is in reality the "White Straits" of the early navigators. This island was called by Schswatka "Turenne Island," but is known among the natives as "Big Island." The exposure of all the instruments was similar to that described above, but the anemometer was considerably sheltered from east and north-east winds. Approximate position of the station, latitude, 62° 33′ N., longitude, 70° 35′ W.

Table IV. Abstract of observations taken by Mr. F. F. Payne, of the Meteorological Service. This station is situated near the north-west angle of Prince of Wales, Sound. The Sound itself is a deep bay, about 30 miles across by about 20 miles deep, with numerous outlying shoals in line of the coast, but good deep water inside. The approximate position of the observatory was latitude 61° 35′ N., longitude 71° 32′ W. The station, being at the head of Stupart's Bay, was somewhat sheltered from north winds; otherwise the exposure was good.

Table V. Abstract of observations at Port de Boucherville, Nottingham Island. Observer, Mr. John McKenzie, C.E. The barometric observations here, are from a very good Casella aneroid, which was compared with the standard and found to have a scarcely perceptible temperature correction; the index correction has been applied, and the reading reduced to sea-level. The anemometer was somewhat poorly exposed, being sheltered, from north-east to north-west, by the rocks which rose almost

perpendicularly behind the house. The approximate position of this station is latitude 63° 12' N., longitude 77° 28' W.

Table VI. Results at Port Laperriére. Mr. P. C. Woodworth, observer. This station is on the Outer Digges Island, near the west end of which we found an excellent harbour, on the shores of which the station was erected. This station commanded a view of both Bay and Straits. The exposure for the instrument was good, though the anemometer was considerably sheltered from S.E. to N.E. winds; but this was, all things considered, one of the best exposures we had. This station is in latitude 62° 34' N., longitude 78° 1' W., approximately.

Table VII is the abstract of results from Churchill. The observer here is Mr. John Spencer, the factor of the Hudson Bay Company, at whose residence the meteorological observations are taken. The thermometers are exposed on the north wall of the house, and read through a small window. There is no fire or heating apparatus of any kind near the room in which this window is, and the doors of the shed were opened by means of cords without opening the window. This exposure was the best attainable; and as the thermometers were read without opening the window, and were constantly screened from direct radiation by the doors of the shed being kept closed, I think the mean temperature may be regarded as approximately correct.

Table VIII gives the average daily temperature as determined from observations taken at 7 a.m. and 8 p.m. of local time, at Fort Chimo, the Hudson Bay port on the Koksoak River, near the head of Ungava Bay. Owing to the nature of his other duties, the observer, who is an officer of the Hudson Bay Company, was not able to undertake the regular tri-daily series; but as observations were frequently taken at 2 or 3 p.m., advantage has been taken of them to obtain the highest temperatures, though they were, of course, disregarded in obtaining the means. In high northern latitudes, during the winter months, the daily curve of temperature almost vanishes, the changes seeming to be dependent on the movements of barometric areas and the consequent direction of winds.

These temperature observations seem to indicate the probability of the existence here of winds similar to the Fohn or Chinook winds; the mountains lying immediately to the eastward rise up in an almost unbroken chain to heights of from 4,000 to 6,000 feet, extending from Cape Chidley to Cape Mugford; over these the east and south-east winds have to rise, and, discharging their moisture in the shape of snow on the eastern face of the range, are warmed again in their descent to the level of the sea on the shores of Ungava Bay.

Table IX gives the results of observations taken at York Factory for a long period of years. These results are the mean monthly, quarterly and annual temperatures during 23 complete years. This table gives a very approximate idea of the amount of fluctuation in temperature which is likely to occur in the individual seasons, though in each of the first two tables, the mean temperatures being derived from the 8, 2 and 8 series, are considerably above the true mean of the 24 hours. I have, therefore, entered also the mean 8 a.m. and 8 p.m.

Table X is the mean monthly temperature at 8 a.m., local mean time, from the series 1842 to 1854.

Table XI is the mean monthly temperature at 2 p.m., and may be regarded, except in the months of June, July and August, as nearly equal to the mean maximum reading. Period, 1842 to 1854.

Table XII is the mean monthly temperature at 8 p.m. Same series of observations as two preceding tables.

Table XIII is the average deviation from mean without regard to sign, between the mean temperature of each month and year and the monthly and annual averages of each group, as given in the preceding tables.

Table XIV shows the highest temperature in each month and year from observations made in the several groups of years. In the first two groups the entries are taken from the readings of the ordinary thermometer; in the last period a good maximum thermometer was used, and the readings of this instrument are entered.

Table XV gives the lowest temperatures, in each month and year, taken from observations made in the several groups of years. In the first two the results are taken from the recorded readings of the ordinary thermometer, at the hours of observation; in the last group the readings of a minimum thermometer have been taken.

Tables XVI to XX give the results of the observations of the velocity and direction of the wind at each of the stations in Hudson Straits, the number of observations in each month from each of the sixteen points, and the average velocity of all the winds from each point in each month and in the year.

Table XXI gives the number of days in each month at each station when the velocity of the wind equalled a moderate gale (30 miles an hour) or exceeded this amount.

Table XXII gives the number of hours' fog reported at Belle Isle Lighthouse, at the Hudson Straits Stations, and at Fort Churchill; this table, shows for July and August the following comparison:—Belle Isle has 472 hours, or nearly 20 days, of fog; as against this, Digge's Island, near the warmer waters of the Bay, has 396 hours, whilst Nottingham Island, only 30 miles farther north, has in the same period only 136 hours. The stations Ashe Inlet and Stupart's Bay give one 180 hours and the other 187 hours respectively, the amount again increasing, as the eastern end of the Straits is reached, to 240 hours at Port Burwell.

Table XXIII shows number of hours' snow at the several stations named.

Table XXIV gives the highest, lowest and mean temperatures taken on board H.M.S. "Fury," under the command of Capt. Sir Ed. Parry, in 1821, 1822 and 1823. Both winters were spent near the head of Fox Channel, though the stations do not fall within the limits of the Temperature Charts which accompany this report.

Table XXV is a weekly abstract of observations taken on board the "Alert" in the cruise of 1886—the means are obtained from a bi-hourly series of observations; the maximum and minimum being taken, from the highest and lowest readings of the ordinary thermometer, recorded. The instruments used were, an aneroid barometer by Casella, which had been carefully compared with an Adies' marine barometer, B. T. Pattern, the error of which had been carefully determined; the observations have been corrected for instrumental error and reduced to sea level. The temperature was obtained from a Sling psychrometer, made in the Meteorological Office. It consisted of two thermometers—Negretti and Zambra—Kew tested, fastened on a walnut wood frame, with an aperture cut in the head of it to fit the hand. The bulb of the wet thermometer projected about two inches below that of the dry, and both were protected from accident by a light strip of metal being carried in the form of a bow beyond the bulbs.

Table XXVI gives the mean daily temperatures of the sea surface from a bi-hourly series of observations.

The following is Mr. Payne's report on the "Flora" and "Fauna," observed at his station:—

FLORA AND FAUNA OF PRINCE OF WALES SOUND, HUDSON STRAITS.

F. F. PAYNE.

During a stay of thirteen months at Prince of Wales' Sound, Hudson Strait, with the primary object of taking meteorological observations, and having some leisure time, I devoted as much of this time as was possible to the study of the natural history of this region, making collections of the mammals, birds, fishes, insects and plants; also, making numerous notes from my own observations, and from such information as I could gather from the Eskimo, who are most keen observers of nature.

So much has been written descriptive of the habits of the mammals and birds found in these regions by those who accompanied the expeditions of Drs. Hayes and

Kane, and by other able writers, that it would be almost useless to go over the same ground again; I shall now, therefore, only dwell briefly on such other items of interest as came under my personal observation and knowledge, giving the dates of migrations, &c., of each species in the order in which they stand.

MAMMALIA.

Polar Bear (Ursus Maritimus, Linn) (Nannook, Eskimo).

The polar bear, though numerous 200 miles to the westward, is scarce in Prince of Wales' Sound; and although a sharp lookout was kept for them, only four were seen, one of which was shot.

The Eskimo informed me it was useless to look for them during the winter, as they were never seen until June, when the ice is breaking up. They are then occasionally taken on the ice-floes, as they drift to the eastward with a regular current that sets this way, which is of great assistance to the bear in its migrations.

At this season the seals, on which the bear mainly subsists, are very numerous, and are captured while they sleep, the bear creeping to within a short distance, and then running at full speed upon them.

Though almost a marine animal, the bear occasionally visits the land, where it regales itself on the young grasses, the eggs of the gull and duck, and has been seen capturing salmon and trout by driving them into a corner in shallow streams.

On the whole, I do not think it is as fierce as it is generally supposed to be, for although many enquiries were made of the Eskimo as to this, they could not recall a single instance of its having attacked any of their people; nevertheless, it is feared by the women, who were careful not to be alone at the time several were seen, and all of them expressed fear of it.

Wolf (Canis Lupus Occidentalis) (Armarho, Esk.)

Little can be said of this animal, as none were seen during my stay here; and I was informed by the Eskimo they were now seldom taken, though at one time very numerous.

They are very troublesome to the Eskimo, often tearing their seal-skin boats or kayaks in pieces and devouring the skin, which they relish very much.

Their food is very varied, and their appetite is so great there are few animals they will not attack and devour; even the Eskimo dog is occasionally carried off.

Their fur is very much valued by the Eskimo for clothing, but as a rule goes to the trader for powder, lead and tobacco.

Wolverine (Gulo Luscus) (Kubvie, Esk.)

This is the Eskino's greatest enemy, and should one appear at any time near their camps they will not rest until it has been killed; and when one is brought in there is great rejoicing. It is the most ingenious thief of all the animals in this region, and is so strong that no cache is safe where it exists. It will turn heavy stones over, and once in the cache it does not stop to untie the well-made skin-bag, but soon tears a hole, and, Eskimo fashion, lives on oil and blubber until the bag is emptied, when it turns its attention to the next cache.

The thieving propensities of this animal are so like that of a dishonest human being, that an Eskimo who is known to be a thief is always called a "Kubvie" by his people.

Fortunately this animal is not numerous in the Sound, though they are often trapped a few miles to the westward, where they, like the wolf, are seen throughout the year.

Arctic Fox (*Vulpes lagopus, L.*) (*Ter i-in-i-ak, Esk.*)

There are two varieties of this animal common in these regions—the blue and the white—the habits of which, with a few exceptions, are so like that of the red, black and silver gray foxes, all of which were seen, that it will only be necessary to speak of them as a single species.

In the early part of September, the white fox began to appear in large numbers upon the coast, and shortly afterwards those of other colours, which are much rarer, were reported as having been seen.

At this time the fur of all the foxes is very short, and that of the Arctic fox is or the most part of slatish colour, though in some instances almost white, with a ew scattered black-tipped hairs.

Spring traps were kept set throughout the winter, and a number of red and white foxes were taken, by which means we were enabled to note the changes in the colour of the fur.

Late in November the fur was still very grey, especially near the roots of the hair, and showed little change a month later. During January, the fur appeared to grow very fast, and by the middle of that month was perfectly white, with the exception of small tufts of the old hair, which, in a great many instances, remained entangled in the new throughout the winter. It was also generally noted that the largest and best conditioned foxes had the best fur.

During the winter the fox depends almost entirely upon the lemming (*myodes torquatus*) for subsistence; but during the seal-breeding season it may often be seen roaming over the ice in search of the young seal, and when very hungry will attack the older ones.

On visiting the traps one day, it was found that a fox had been caught, but had by some means gone off with the trap. As it was supposed it could not go far, it was tracked in the snow; but after walking five miles the attempt to come up with it was given up. Three weeks later this fox was sighted a few hundred yards from the observatory, and was given chase by an Eskimo, who soon captured it, when the jaws of the trap were found to be deeply imbedded in the leg.

Unlike the red fox, the white fox, when caught, will howl most piteously as it is approached by the trapper, and upon going up to it, it immediately stands on the defensive, and will fight most fiercely for its life.

After 1st February foxes became very scarce, and few were taken, the last being seen on 10th May. A few remain on the coast throughout the year, but nearly all migrate to the interior, where they can enjoy the luxuries of young ptarmigan and other birds, besides the pleasures of scratching their backs upon small bushes when undergoing the difficult process of change of clothing.

Eskimo Dog (*Canis Familiaris, Linn*) (*Kingmik. Esk*).

The Eskimo dog so nearly resembles the wolf (*Canis Lupus Occidentalis*), it is difficult to describe it as other than that animal, excepting when in harness and under the lash of its master's whip.

When at liberty it may often be seen roaming over the country in search of the lemming or other food, and appears only to care for its master for the food it may get from him.

There is only one redeeming quality in its habits, and that is its simple appetite; it will live a great length of time without food, and is not at all particular what it eats, as the following list of articles which I have seen it devour will show:—An old cloth hat, a boot, part of a flannel shirt, part of a pair of trousers, without the buttons, and a lot of greasy felt gun wads, which were seen the next day carefully placed beside a stone undigested. It may be added, *en passant*, these gun wads were subsequently used by an Eskimo for his gun.

As might be supposed, the dogs do not grow very fat; nevertheless, they are often slaughtered for food during hard times, and their skins are made into clothing.

In harness the Eskimo dog appears as a different animal. It is then fed occasionally upon the skin of the walrus and other refuse; but woe betide the dog that refuses to pay for this food by pulling too lightly upon the load that is given it; thrashing is then too good for it, it must pay with a part of its body; and carelessly going up to it, the quiet though enraged Eskimo will take his knife and cut a small piece off its tail or ear, and will as coolly return to the sleigh with the call, "Whoots!" which means, get on.

Having a large Newfoundland dog with me, which was brought up on the ship from the Labrador coast, it was very interesting to watch its treatment of and by its Eskimo neighbours. From first to last the males were deadly enemies, my Newfoundlander disdaining to have anything to do with them, but with the females he was a particular favourite, thereby causing some most terrible rows in the camp.

Reindeer, Rangifer Tarandus (Linn, Baird) (Took-too, Esk.)

The reindeer is only a summer visitor to the coast, arriving in the early part of April, and leaving again for the interior in November.

The horns of those taken about 10th April were soft, and a great many were covered with velvet.

At this time of the year, a great stir is noticed among the Eskimo, and in a few days all leave for the hunting grounds, a few miles inland, where the deer are most plentiful, returning to the shore again about six weeks later.

The reindeer is undoubtedly the most useful animal to the Eskimo that is found in these regions, its hide being used for clothing and bedding, its horns for spear and arrow heads, and the lining of its belly for sewing thread, while the fat, which is usually melted down, is one of the greatest luxuries the Eskimo possess.

In June the young are dropped, and during this month and July the deer is not molested, as the Eskimo is then too busily engaged in seal hunting. In August the hunt again commences; and at this time the Eskimo secures all the skins he can for winter use; unfortunately, however, owing no doubt to the large number that are killed annually for their tongues, which are shipped to the London market, they are not so numerous as formerly, and many a poor Eskimo has to make shift with a few thin skins for his bed, and the same for his clothing, throughout the winter.

While exploring one day a natural deer-trap was found, in the shape of a wide crevice in the side of a hill that had, doubtless, been formed by the action of frost. The sides were perpendicular and about twelve feet high; and in it were the skeletons of several deer, and one that had recently fallen in.

Polar Hare (Lepus Glacialis, Leach) (Ookaluk, Esk.)

Like other varieties of the same species, the polar hare is a most timid animal, and is so watchful of its enemies that it can seldom be seen to any advantage, and is only shot as it passes like a ball of snow in its swift retreat; nevertheless a few fine specimens were taken and added to my collection.

Although it undoubtedly remains here throughout the year, none were seen until the month of December; and from that time until the end of May in the following year, its well-known tracks could be seen in the snow in every direction. Its food consists of a number of small plants, especially the knotty roots of certain grasses which it obtains by burrowing in the snow and moss.

Hudson's Bay Lemming (Myodes Torquatus Pallas—Mus Hudsonius, Forster) (Avingnuk Esk.)

This is the smallest of the quadrupeds found in these regions, and apparently only inhabits the coast, where it is so numerous, that by turning over a few stones, one or more are sure to be found.

On a still winter's night, when everything appears hushed in sleep, this interesting little animal may be heard in every direction, boring through the snow; every now and then stopping as if to take breath, and again returning to its labours. Then is the time its enemy (the fox) stands and listens, and then pouncing upon the spot where the boring is heard, cuts off its retreat, and, with little trouble, secures its prey.

The fur of the lemming is of a greyish colour in the summer time, gradually turning whiter as the winter approaches, but never becoming perfectly so. In some cases the skin was found perfectly hairless in parts that had been affected by a parasite, which infests this animal.

Walrus (Trichechus Rosmarus, Linn) (Iviuk, Esk.)

The walrus is not numerous at any time in the Sound, and disappears altogether in July, not returning again until about the middle of November; it is then eagerly looked for by the Eskimo, who may be seen exploring the ice from a neighbouring hill with their telescopes, and occasionally walking out to the open water when one is sighted.

During my stay here very few of these animals were seen, and of those taken only one was an adult specimen, the others all being very young.

The tusks of the walrus are of great value to the Eskimo for spear heads, and for many other purposes, the ivory often being sawn into lengths and used in shoeing their sleighs.

Great Seal (Phoca Barbata, O. Fab.) (Oog jook Esk.)

This is the largest of all the seals found in these waters, and next to the deer, it is perhaps the most valuable animal to the Eskimo.

It arrives in the Sound soon after the ice has broken up, about the end of June, and although never very numerous, they are taken from that time until the Strait again fills with ice towards the end of October.

In common with other seals, they are shot or harpooned either while they sleep on the ice or while swimming in the open water.

The Eskimo say the great seal has never been known to breed here, and all those taken during my stay must have been over five months old.

The skin of this seal is used in making kayaks or boats, and harpoon lines of great length are made from it by cutting the skin in a narrow strip round the body as you would peel an apple. It is also used for the soles of boots, the hair being first scraped off and the skin then dried in the sun, and afterwards going through a process of chewing by the female Eskimo.

Harp Seal (Phoca Grœnlandica) (Kyro-lik, Esk.)

The harp seal, so named from a distinct harp shaped mark upon its back, arrives in the Sound a little later than the great seal, and is much more numerous, leaving again as soon as the ice approaches in October. It does not often take to the ice, but may be seen swimming a short distance from land, and is seldom alone, there almost invariably being several together.

With the exception of one or two, all those taken were adult seals, the youngest being about four months old.

The skin of this seal which is very large, is used in making wigwams, and for the upper parts of Eskimo boats.

Rough Seal (Phoca Fœtida, Fab.) (Natchuk. Esk.)

This is the most numerous of all the seals found in these waters, and constitutes the principal part of the Eskimo's food. It remains here throughout the year, but is scarce during the months of February, March and April.

The first young seal taken was on 5th March, and about this time several more were seen. They are born on the ice where the snow is deep, the parent seal making a most comfortable house under the snow. These houses are not easily found and are only detected by a small mound slightly above the level of the snow.

It is often wondered how the seal may be seen to appear on the ice where only a short time before not a hole could be seen, and some writers on the subject have declared the seal makes a hole from the under side of the ice by keeping its warm nose pressed against it. This appears so absurd, that during my stay here a careful examination was made of all the seal holes that were seen, and in every instance they were found along the line of wide cracks that are constantly being formed by the ever-changing tides. As will be readily understood, the water between these cracks soon freezes and becomes covered with snow and the seal keeps a hole open by constantly diving and returning again to breathe, until, by the accumulation of ice caused by the seal splashing, the hole becomes too small when it again shifts its position to the nearest crack in the ice.

Many are the arts the Eskimo resorts to capture this seal and perhaps the best is by two hunters, one of whom lies down at the edge of the ice near some open water, while his companion remains about ninety yards further from the edge. Here he scrapes upon the ice with his spear and whistles in a low note whilst the charmed seal, if there is one anywhere near, slowly swims towards the object at the edge of the ice, and when near enough is surprised with a charge of shot, a bullet, or a spear.

Right Whale (Balæna Mysticetus Linn.)

Only two of these whales were seen and as the Eskimo seldom meddle with them, little could be learned of their habits.

They apparently only pass here on their way to or from Hudson Bay, and will not attempt to make the passage while there is much ice in the strait.

Portions of what undoubtedly were the skeletons of three of these animals were found on the shore, and the Eskimo informed me that at one time when there were more of their people living here, they would not hesitate to surround one of these huge monsters in their kayaks and with harpoon and floats would sometimes succeed in killing one.

Narwhal (Monodon Monoceros, Linn.) (Uylung-war, Esk.)

Commonly known as the unicorn. The narwhal is often met with in the Strait, and is much valued for its large ivory tusk, which often measures five feet in length. Only one of these animals was seen late in the summer, and the remains of another was found on the shore, the tusk of which measured four and a half feet.

White Whale (Beluga Catodon, Gray), (Kelleluak, Esk.)

The white whale, though indigenous to the Strait, does not come near the coast until the ice begins to open, the first seen being on 26th April, when there was some open water about five miles from the shore. From this time they were often seen throughout the summer, sometimes singly, but oftener in small schools following the line of the coast. Then the Eskimo may be seen standing motionless at some prominent point, with gun ready, waiting patiently for a shot. To one accustomed to extremely quick shooting, a white whale might seem an easy mark to hit, but with the unexperienced, to make the best of it, the bullet never seems to strike anything else than the place where the whale's head was.

During the summer this animal forms a large part of the Eskimo's food and is eagerly hunted by them.

Birds.

Stone Chat (Saxicola œnanthe, L.).

This is, perhaps, the most valuable zoological specimen that was taken during my stay in the Strait. It was the only one seen, and is described by Mr. Whiteaves, Palæontologist of the Geological and Natural History Survey of Canada, who identified all the birds in my collection, as being an "adult male of a European species not previously recorded as occurring in Canada, though found in Greenland.

This active little bird was shot, after a long chase, on 19th May.

Shore Lark (Eremophila Alpestris, Forster).

Arrived 17th May; mating 1st June; young fledged 15th July; was last seen on 10th August.

This bird was very numerous during the summer.

Water Thrush (Siurus nœvius, Bodd).

Arrived 20th May; mating 1st June; young fledged 25th July. Last seen on 1st October. A great number of these birds were seen.

Lapland Longspur: Lapland Bunting (Plectrophanes Laponicus, L.)

Arrived 14th May. This was the only specimen seen and taken.

Snow Bunting (Plectrophanes nivalis) (Copenoir, Esk).

The first snow bunting seen was on 1st April, and shortly afterwards they were very numerous. They were mating about 25th May. Young were fledged about 16th July, and about 23rd August the adult birds appeared to leave, returning again a month later, and by 21st October all had disappeared.

Raven (Corvus Corax, L.) (Tooloouk, Esk).

The raven is indigenous to the country, and although most of them appear to migrate southward, a few were seen throughout the winter. They were mating about 25th May, and young were fledged 15th July.

This bird is the Eskimo's companion, following him everywhere in his hunts, and when a seal is shot will perch only a few yards from him and "caw" most vociferously.

They do not seem to understand the mechanism of a fox-trap, and are often caught in the act of taking the bait.

Gyr Falcon (Falco sacer, Forster).

Arrived 6th September. They were not often seen until about 15th September, when a number were observed apparently flying south. The last seen was on 20th September.

Rough-legged Buzzard (Archibutes lagopus, Brunnick).

Arrived on 15th May. Were rather numerous throughout the summer. Fledglings seen on 20th August. Last seen on 30th September.

Snowy Owl (Myctea Scandiaca) (Ook-pi, Esk.).

Only two of these birds were seen in September, neither of which were taken.

Rock Ptarmigan (*Lagopus rupestris, Gmelin*).

Arrived 11th May, mating 30th June, when they were very numerous. Young fledged 18th August, and last seen on 30th October.

Ring-necked Plover (*Œegialitis semipalmatus, Bon.*)

First seen on 1st June; mating, 10th June; young fledged, 12th July; last seen 25th September. These birds were very numerous throughout the summer. One was seen to pick up its young and fly some distance with it.

Red Phalarope (*Phalaropus fulicarius, L.*)

First seen on 31st May. Several of these birds were brought to me during the month of June, but after 1st July none were to be seen.

Purple Sandpiper (*Tringa maritimi, Brunn.*)

Only one of these birds was seen and shot on 27th May.

White-rumped Sandpiper (*Bonapartes Sandpiper, Tringa Bonapartii, Schlegel.*)

None of these birds were found breeding, but a few were seen after 1st July, and about 10th August, very large flocks arrived, remaining until 20th September, when the last of them were seen.

Brant Goose (*Bernicla Brenta, Stephens.*)

The Brant Goose does not breed here. A few were seen in company with Hutchin's goose in their flight southward on Septrmber 15th, and one was brought to me by an Eskimo on December 1st.

Hutchin's Goose (*Bernicla Hutchinsi, Richardson.*)

This bird, in company with the Brant and Snowy Goose, arrived in great numbers on September 6th, and remained here five days, all disappearing when the wind shifted to the southward.

Snowy Goose (*Chen Hyperboreus.*)

Thousands of these birds, in company with those just named, arrived here during a gale on 6th September, and were so tame that seventy were shot in a few hours with very little trouble. They remained here five days, when a steady breeze springing up from the southward, they all disappeared within a few hours, and none were seen after 12th September.

Long-tailed Duck (*Harelda Glacialis, L.*)

The first of these birds seen was on 1st June, and the first fledglings found was on 31st of August.

This is one of the most numerous and certainly the most noisy duck that visits these regions; its long drawn note of "ar-ar-ow-oo" may be heard in every direction.

Its eggs were found on the margin of ponds, from which small streams ran to the sea, and through these the parent bird was seen to conduct her brood when about ten days old.

The last of these birds seen was on 10th November.

Harlequin Duck (Histrionicus Torquatus L.)

The harlequin duck was most numerous during the month of June, but after the end of that month none were to be seen. Apparently this bird does not breed here.

King Eider (Somateria Spectabilis, Leach.)

Large flocks of these birds arrived about 5th May, almost darkening a small piece of water about five miles from the shore, About 1st June, pairs were seen to visit small lakes inland, where, as soon as the ice had melted round their shores, the eggs of this bird were found in nests of down on small mossy islands.

The King Eider lays from four to six eggs, and in some instances continued to lay in the same nests after they had been robbed of the first two or three eggs.

Two nests with eggs of this bird were found several hundred yards from the water, upon a high ledge of rock, from which it would be impossible for a young bird to descend without assistance.

The first young seen was on 25th August, and, like the long-tailed duck, the parent bird in a few days conducts her brood to the sea.

The last of these birds seen was on 30th November.

Herring Gull (Larus Argentatus, Brunnick), (Nowia, Esk.)

First seen on 20th April; was mating 1st June; young were fledged on 12th August. Last was seen on 15th November.

This bird is very numerous throughout the summer, and its nests and eggs were found beside those of the King Eider, on small mossy islands.

Common Tern (Sterna hirundo, L.), (Emo-Cootalia, Esk.)

Eggs and specimens of these birds were brought to me by Eskimo on 20th July, from a small island about six miles from the coast. These were the only ones seen during my stay here.

Great Northern Diver, Loon (Colymbus torquatus, Brunnick).

The first of these birds seen was on 1st June, and the last seen 20th August. None of the young of this bird were found, and I think that very few breed here.

Red Throated Diver (Colymbus Septentrionalis L.), (Coxzow Esk.)

This bird arrived about 20th June, and was often seen during the summer.

Only one nest of this bird was seen, a little above high tide mark; and the Eskimo informed me they could seldom be found.

On 7th August some fledglings were seen, and all had disappeared by 28th September.

Black Guillemot (Uria grylle, L.).

This interesting little bird is seen here throughout the year, being most numerous during the summer.

During the coldest weather it was often taken on small pieces of water where the ice had been broken by the ever-changing tides.

Quantities of eggs of this bird were brought to me by Eskimo from an island about four miles from the coast, and fledglings were seen on 10th August.

Little Auk (Mergulus alle, L.).

A small number of these birds were seen some distance from the shore during the summer, but nothing could be learned of them. One specimen was taken.

Besides those in the above list, several other birds were seen, including varieties of gulls, skuas and a small land bird; but as specimens could not be secured, and they could not be identified, I have not included them in this list.

Insects.

The first insects seen were a single species of spider and fly on 1st June, and it was not until three weeks later that other forms made their appearance, excepting a humble bee, which was seen on 14th June.

On 30th June the first butterflies were seen, and a little later insect life was at its extreme height, lasting until about 5th August, when it declined rapidly, and a weeks later few insects were to be seen. During this time there would be periods of several days of dull weather when bees only were to be seen on the wing.

A large collection of Lepidoptera, Hymenoptera, Coleoptera and Diptera was made, but it is to be regretted I have only succeeded in getting the butterflies identified, of which the following is a complete list, and they are the only species that were seen during my stay in the Straits.

—	First seen.	Numerous.	Last seen.
Colias Hecla, Lef	July 17	July 20 to Aug. 4	August 15.
Colias Nastes, Bd	July 17	July 20 to Aug. 5	August 17.
Argynnis Polaris, Bd	June 30	July 10 to Aug. 1	August 5.
Argynnis Freya, Thunb	June 30	July 10 to Aug. 1	August 4.
Chionobas Semidea, Say	July 1	July 5 to Aug. 30	August 9.
Chionobas Crambis, Frey	June 30	July 5 to Aug. 30	August 10.
Chionobas Taygeta, Hub	June 30	July 5 to Aug. 30	August 10.
Lycæna Agnilo, Bd	July 26	July 26 to Aug. 8	August 5.

These butterflies were identified by W. H. Edwards, Esq, of New York.

Flora.

In adding the following list of plants to this report I am much indebted to the kindness of Prof. Lawson, of Dalhousie College, Halifax, who identified all those in my collection.

Notes upon the growth of each plant were generally made from individual specimens, and in all cases were made upon those in the same neighbourhood where exposure, soil, &c,, were similar.

List of Plants in Natural Order.	In Bud.	In Leaf.	In Flower.	Seeds Ripe.	Withering.	Remarks.
Ranunculaceæ :—						
Ranunculus nivalis, L.........	....	June 30	July 5	Aug. 18	Aug. 20	Growing in very damp soil.
R. hyperboreus, var. pyginæus	....	....	July 25	....	....	
Papaveraceæ :—						
Papaver alpinum, L. (nudicaule)........................	May 20	June 1	June 30	Aug. 6	Sept. 1	
Cruciferæ :—						
Draba alpina. L., var...........	....	June 25	July 1	....	....	
Cochlearia officinalis, L.	June 15	June 22	June 22	Aug. 18	Aug. 26	
Caryophyllaceæ :—						
Cerastium alpinum, L..........	June 15	June 22	June 30	Aug. 15	Sept. 8	
C. vulgatum, L.	....	....	....	....	....	
Stellaria longipes, var. d...... (taeta, Richards)	June 15	June 22	July 8	Aug. 20	Sept. 12	
Lychnis apetala, L	....	June 30	July 5	Aug. 20	Aug. 20	
L. apetala, var. affinis..........	June 15	June 22	July 2	Aug. 14	Aug. 20	
Silene acaulis, L	May 26	June 1	July 5	Aug. 22	Sept. 8	Sept. 16.—Some leaves still green.
Houckeneya peploides, Ehr...	June 10	June 20	July 10	Aug. 6	Sept. 1	
Leguminosæ :—						
Astragalus alpinus, L.	June 20	June 25	June 30	Aug. 19	Aug. 25	
Oxytropis arctica, R. Br.	June 20	June 26	July 7	Aug. 20	Sept. 5	
Rosaceæ :—						
Dryas integrifolia, Vahl.	June 9	June 18	July 1	Aug. 20	Sept. 1	
Potentilla nivea, L						
P. maculata, Lehm...............	May 25	June 3	June 22	Aug. 6	Aug. 20	Sept. 5.—Some leaves still green.
Rubus chamæmorus, L	June 20	July 5	July 7	Aug. 5	Sept. 1	
Onagraceæ :—						
Epilobium latifolium, L........	June 25	July 1	July 15	Sept. 5	Sept. 9	
Halorageæ :—						
Hippuris maritima, Hellen.......	....	....	....	....	....	
Saxifragaceæ :—						
Saxifaga cernua, L	June 20	....	July 10	Aug. 27	Sept. 3	
S. tricuspidata, Retz	May 25	June 10	July 4	Aug. 20	Sept. 12	
S. oppositifolia, L................	May 20	June 1	June 18	Aug. 15	Aug. 25	
S. rivularis, L	....	July 1	July 10	Sept. 3	Sept. 8	
S. nivalis...........................	June 23	June 30	July 7	Aug. 26	Sept. 8	
S. nivalis, L. var. B.	....	....	....	....	....	
S. caespitosa, L..................	May 20	June 1	June 28	Aug. 25	Aug. 31	
Parnassia palustris, L........ ..	....	....	....	....	....	
Compositæ :—						
Erigeron uniflorus, L............	....	June 28	July 10	Aug. 27	Sept. 3	
Arnica alpina, Læst..............	June 27	July 5	July 12	Aug. 20	Sept. 3	
Antennaria alpina, L	May 26	June 10	June 22	Aug. 12	Aug. 12	
Taraxacum officinale, var. palustre. D. C. .... (B. salinum, E. Meyer)	June 3	June 20	July 4	Aug. 1	Sept. 5	
Mattricaria inodora, var. nana	....	....	July 28	....	....	

LIST OF PLANTS—*Continued.*

List of Plants in Natural Order.	In Bud.	In Leaf.	In Flower.	Seeds Ripe.	Withering.	Remarks.
Campanulaceæ:—						
Campanula uniflora, L.	June 25	July 1	July 5	Aug 16	Aug. 25	
Ericaceæ:—						
Vaccinium uliginosum, L.	June 15	June 25	July 7	Aug. 25	Sept. 10	
V. Vitis-Idæa, L.	May 20	June 1	July 1	Aug. 31	Sept. 10	Leaves remain green throughout the winter. Fruit does not fall until spring.
Cassiope tetragona, L.	June 1	June 15	June 25	Aug. 25	Sept. 5	Leaves remain green during the winter.
Arctostaphylos alpina, Spr.	June 1	June 22	June 22	Aug. 31	Sept. 14	Large quantities of the fruit of this plant is eaten by Eskimo.
Ledum palustre, L.	May 25	June 1	July 1	Aug. 26	Sept. 8	
Diapenzia Lapponica, L.	May 20	June 1	July 1	Aug. 31	Sept. 5	Some leaves are green throughout the winter.
Pyrola minor, L.	....	May 25	July 10	Aug. 30	Sept. 6	
Rhododendron Lapponicum, L	May 15	May 25	June 25	Sept. 5	Sept. 10	
Borraginacaæ:—						
Mertensia maritima, Don	June 15	June 22	July 5	Aug. 25	Aug. 28	
Scrophulariaceæ:—						
Pedicularis flammea, L.	....	July 5	July 12	Aug. 20	Aug. 25	
P. Langsdorffii, var. lanata A. Gr.	June 1	June 10	June 20	Aug. 12	Aug. 18	
P. hirsuta, L.	June 1	June 15	June 20	Aug. 10	Aug. 20	
P. Lapponica, L	July 3	July 12	July 17	Aug. 26	Aug. 30	
Plumbaginaceæ:—						
Armeria vulgaris, Willd.	June 15	June 22	June 30	Aug. 31	Aug. 31	
Polygonaceæ:—						
Oxyria digyna, Hill; (remformis, Hook)	June 10	June 15	June 22	July 28	Sept. 11	
Polygonum viviparum, L	June 12	June 22	July 1	July 25	Sept. 1	
Empetraceæ:—						
Empetrum nigrum, L.	June 28	July 6	....	....	Sept. 10	Where sheltered this plant remains green until Sept. 30.
Salicaceæ:—						
Salix herbacea, L.	June 10	June 15	June 22	Aug. 30	Sept. 10	
Juncaceæ:—						
Luzula campestris, Sm. var. (congesta)	June 20	July 1	July 10	Aug. 10	Aug. 28	
Cyperaceæ:—						
Carex alpina, Sw.	....	....	....	....	....	
Eriophorum polystachyon, L.	....	....	....	....	....	
E. vaginatum.	....	July 10	July 15	July 25	Sept. 5	
Gramineæ:—						
Poa laxa, R. Br.	....	....	....	....	....	
P. pratensis, var	May 25	June 12	July 10	Aug. 24	Sept. 8	
Elymus mollis, Trin.	May 25	June 1	July 15	Aug. 28	Sept. 1	
Alopecurus alpinus, L.	June 10	June 20	July 15	....	Sept. 10	
Hierochloe alpina, L.	June 1	June 22	July 10	Aug. 25	Sept. 1	
Festuca brevifolia, R. Br.?	June 20	July 1	July 15	Sept. 3	Sept. 8	
Trisetum subspicatum, var. molle, A. Gr.	June 1	June 25	July 15	Aug. 31	Sept. 8	Sept. 20.—Some blades still green.

LIST OF PLANTS—*Concluded.*

List of Plants in Natural Order.	In Bud.	In Leaf.	In Flower.	Seeds Ripe.	Withering.	Remarks.
Filices:—						
Aspidium (Lastrea) fragrams, Sw.	....	June 1	June 1	....	....	Sept. 10.—Leaves still green.
Cystopteris fragilis, Berub	....	June 30	June 30	....	....	Sept. 10.—Leaves still green.
Lycopodiaceæ:—						
Lycopodium selago, L.	....	....	....	....	....	
Algæ:—						
Fucus vesicalosus, L.	....	....	....	....	....	
Laminaria saccharina, L.	....	....	....	....	....	
Alaria Sp., possibly A. margenata, Postelis and Ruprecht	....	....	....	....	....	
Chetomorpha Piquotiana, Mont.	....	....	....	....	....	
Rhodymenia palmata, L.	....	....	....	....	....	
Ptilota serrata.	....	....	....	....	....	
Ulva tatissima, L.	....	....	....	....	....	

NOTES.

8th March —Lichens exposed to the sun, now show signs of life, their colours becoming much brighter.

1st June.—Grasses have made very little growth, and few new blades are to be seen, though last year's blades have grown above ground, and can be seen making slow progress with withered points.

10th June.—Up to the present time vegetation has been very slow, and little change has taken place in any of the plants.

From 12th to 22nd June, all plant life appeared to make rapid strides, but after the latter date few plants showed any growth until 10th July when marked changes took place.

9th September.—Very few plants have put forth any new leaves since their seeds were ripe, but many remained green until the first cold nights. Now, however, nearly all have withered or are withering, the leaves in many instances taking the bright autumnal tints that are seen in lower latitudes.

It is very noticeable that the growth of the plants is very much more forward at all times, near the line of high water along the coast, than at a distance of several hundred feet from it.

Flies, which are very numerous here, evidently share very largely with the bee in fertilizing, as they may often be seen crowding about the blossoms of different plants in large numbers.

On 26th May, by way of experiment, a piece of sandy loam was prepared in a well-exposed position, and peas, spinach, turnips and garden cress were sown.

On 22nd June, peas, turnips and cress were well above ground, whilst the seeds of the spinach had scarcely germinated.

On 7th July a few spinach plants were just above ground; the peas were about five inches high, while there was no perceptible change in either turnips or cress.

No further changes of growth of any of these plants were noticeable during the remainder of the summer.

Heights of Eskimo.

I append the following heights of Eskimo as they may be of use to those interested in the subject.

When measured, the Eskimo wore native boots and socks, measuring in all about three-eighths of an inch in thickness.

Men.			Women.		
Age, Estimated.	Feet.	Inches and Half Inches.	Age, Estimated.	Feet.	Inches and Half Inches.
35	5	2½	28	5	1
38	5	5½	26	4	9½
45	5	7	36	5	½
40	5	8	50	4	9½
36	5	4½	30	5	1½
37	5	4	....	....	....
32	5	4	....	....	....
48	5	2	....	....	....
38	5	3	....	....	....
38	5	7½	....	....	....
35	5	3	....	....	....

F. F. PAYNE,
Observer in Charge, Stupart's Bay Station, and Assistant Meteorological Service of Canada.

REPORT BY ROBERT BELL, B.A.Sc., M.D., LL.D., ASSISTANT DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

Sir,—I have the honour to submit the following report on certain scientific matters in connection with the Hudson's Bay Expedition of 1886, and in regard to the results of the examinations which have been made of rocks and ores collected around the Bay and Straits by myself, or which have been handed to me by others, in addition to what was contained in my reports on the Expedition of 1884 and 1885 as to the geology and economic minerals of these regions.

I have the honour to be, Sir,
Your obedient servant,

ROBERT BELL.

To Lieutenant A. R. Gordon, R.N.,
Commanding Hudson's Bay Expeditions.

ADDITIONAL NOTES ON THE GEOLOGY OF THE NORTH-WEST COAST OF HUDSON'S BAY.

In the last report which I had the honour of submitting to the Minister of Marine and Fisheries, it was stated that from Seal River northward to Eskimo Point, a distance of about 140 statute miles, the coast was low, with the exception of an occasional isolated hill, probably of drift, and that there was no reason to believe that this interval is occupied by nearly horizontal Silurian strata, similar to those which underlie the section between Nelson River and Cape Churchill. At Eskimo

Point a rocky shore is said to begin, and to extend, with some interruptions, northward to Chesterfield Inlet, a distance of about 180 statute miles. It was also mentioned that the rocks of this part of the coast would appear to consist principally of a variety of schists which cannot be distinguished from those we have classed with as Huronian. I have received from a friend a most interesting collection of lithological specimens, which, at my request, he had broken from the fixed rocks at numerous points along the coast from Eskimo Point all the way to Chesterfield Inlet. Taken as a whole these rock specimens indicate the Huronian series, and from the great extent of coast which they occupy, it may be inferred that they also extend inland and cover a large geographical area. We have some independent evidence also that this is the case. Examples of Laurentian rocks seem to be absent from the collection, but some of the specimens may belong to the intermediate formation, which I have described as coming between the Huronian and the Manitounuck or Nipigon formations on the Eastmain Coast. The Huronian series is the principal repository of economic minerals in the region of the Great Lakes and Hudson's Bay. Marble Island, lying off that part of the coast under consideration, was examined in 1884, and found to consist of whitish quartzites, like those of Lake Huron, as described in my report for that year.

The following list of the rocks in the collection above referred to is considered worth inserting here, as it affords the only evidence as yet available in regard to the geology of an extensive coast, which promises to be important from an economic point of view, and well worthy of careful examination:—

Chloritic schist, dark grey cherty schist, hard dark argillaceous slate, finely ribboned hornblende and quartz schist, imperfect gneiss, dark silicious breccia with calcspar, dark-green crystalline pyroxene rock, dark chocolate-coloured aceous argillceous sandstone with conchoidal fracture, calcspar vein-stones, semi-translucent white quartz, red aplite of medium texture, rather fine-grained grey granite, grey diorite, consisting of light-coloured felspar and dark hornblende in small distinct crystals, giving it an even and finely speckled appearance, fine-grained hornblende schists, greenstones, quartz and epidote rock, light grey coarse-grained sandstone altered to quartzite and holding fragments of indurated red shale, compact banded white quartz-rock with crystals of iron pyrites in some of the layers, light quartzite like that of Marble Island, grey felsites, crystalline hornblende-rock, diorite, consisting of compact white feldspar with long crystals of dark hornblende, banded grey hornblende and quartz-rock with some layers approaching chert, mica schists of different kinds, mixed hornblende and mica-schist, chocolate-coloured porphyry with flesh-coloured crystals of felspar and grains of clear quartz, granulite, red jaspar with dull fracture, hard brownish-red sandstone, grey felsitic quartzite with lenticular patches of dark mica-schist, chloritic schist, the granular iron pyrites associated with dark-greenish schist above referred to, several hundreds of cubes of iron pyrites, mostly small, taken from a dark glossy schist, quartz veinstone with large scales of light-coloured mica together with garnets, calcspar veinstone with embedded crystals of quartz and having grey steatitic rock adhering to it, also a veinstone of quartz containing silky radiating aggregates of hornblende and a few specks of calcspar and iron pyrites; some greenish schist is attached to this specimen. A loose piece of brown-weathering dolomite with reticulating strings of white quartz was found on Marble Island.

The bulk of the primitive Laurentian System in the northern parts of the Dominion consists of massive and very crystalline varieties of gneiss, generally much contorted and seldom exhibiting much regularity of arrangement over large areas. In some of the more northern regions of the country, however, as in the Counties of Frontenac, Lanark, Renfrew, Ottawa and Argenteuil, certain sub-divisions may be recognized and traced by their persistence and individuality of character for considerable distances. It is in such portions of the System that economic minerals such as crystalline limestone, iron ores, graphite, sheet mica, iron pyrites and phosphate of lime are met with, and here also we find a variety of species of minerals which have not been observed among the massive contorted gneisses referred to.

On the north side of Hudson's Straits in the neighbourhood of Turenne Island

there is apparently a recurrence of these more interesting and perhaps newer varieties of Laurentan rocks. Specimens of all the economic minerals just named, except phosphate of lime, have been brought to members of the Expedition by the natives of this vicinity who report them as occurring in abundance. The gneisses along this part of the north shore exhibit a regularity in their strike and marked alterations of character in different belts, such as are not generally to be seen in the north. It may be worth mentioning in reference to this subject that a crystal of sphene an inch in diameter was obtained from an Eskimo who had found it on the mainland opposite Turenne Island.

It was mentioned in my report for 1884 that a specimen of greyish crystalline limestone was picked up near Ashe's Inlet, Turenne Island, which bears a very close resemblance to a variety common in the Laurentian lands of the Ottawa Valley. Since that time Mr. Hoffmann has carefully examined this specimen and found it to contain rounded grains of a monoclinic and a triclinic felspar—the one a potash felspar, apparently orthoclase, and the other a soda-lime felspar, probably oligoclase.

On the Occurrence of Gold and Silver in Hudson's Bay and Straits.

In 1877 I brought specimens of iron pyrites from a small vein cutting gneiss on a point about one mile south of the mouth of Great Whale River, on the east coast of the Bay, about latitude 55° 17′, in which Dr. Harrington, then chemist to the Geological Survey, discovered both gold and silver, by assay. He also found both these metals in small quantities in iron pyrites which I took from veins in the bluish-grey dolomite forming Dog Island, close to the land, a few miles north of the Cape Jones of the Eastmain Coast. In 1885 I obtained from the north-west coast of Hudson's Bay, an angular specimen of crystalline granular iron pyrites, containing grains of quartz and apparently broken from a large vein. The friend who presented it to me had obtained it at the bay north of the Cape Jones of that coast, and which forms the southern horn of Rankin Inlet, not far south-west of Marble Island. It has been assayed by Mr. G. C. Hoffmann, now chemist to the Geological Survey, and found to contain a trace of gold and ·233 of an ounce of silver to the ton of 2,000 lbs.

In 1850 Professor James Tennant, of King's College, London, had submitted to him some rock specimens from Repulse Bay, at the head of Roe's Welcome, a northern extension of Hudson's Bay. He describes one of these specimens as "quartz coloured by oxide of iron and containing minute particles of gold." From Tennant's description of the few specimens he obtained from this locality, I should judge the rocks there to correspond with those of the ordinary Huronian bands north west of Lake Superior, in which free gold has also been found in several places.

On the Eastmain Coast (as stated in previous reports) a few tons of galena have been extracted from the lead-bearing band of dolomite about three miles north-east of the Hudson's Bay Company's trading post at the mouth of Little Whale River. This one was found by Dr. Harrington to contain 5 104 ounces of silver to the ton of 2,000 lbs. Galena occurs in larger masses in similar dolomite on the south side of the entrance to Richmond Gulf. A sample of this ore yielded 12·03 ounces of silver per ton to the same assayer.

The small island in the north-western part of the Ottawa Group (latitude 59° 48′, longtitude 80° 14′) in the north-eastern part of Hudson's Bay, on which I landed in 1885, was found to consist of a dark greenish grey diorite. A small vein, consisting of an intimate mixture of plagioclase and calcite with a few specks of iron and copper pyrites, cuts this rock. A sample from it has been assayed by Mr. G. C. Hoffmann, chemist to the Geological Survey, and found to contain distinct traces of gold, along with ·059 of an ounce of silver to the ton of 2,000 lbs.

The gneiss near the observatory station at Stupart's Bay (south side of Hudson's Straits) is cut by veins of white sub translucent to translucent quartz, carrying iron pyrites and sometimes much stained with hydrated peroxide of iron. A sample made up of fragments from some of these veins, assayed by the same gentleman, contained a trace of gold but no silver.

A vein cutting the gneiss at the observatory station at Port Burwell was described in my report for 1884.

The gauge of this vein consists of a greyish-white translucent quartz, with which is associated a little barite, carrying small quantities of iron pyrites. Some of the fragments collected were stained and coated with hydrated peroxide of iron, and some of the crystals of quartz in this vein had a bright red colour. On assay by Mr. Hoffmann it yielded a trace of gold but no silver.

A specimen of quartz was obtained from a vein said to be of considerable size on the south side of Nachvak Inlet, opposite Skynner's Cove, on the northern Labrador coast, and found by Mr. Hoffmann to contain a trace of gold and ·041 of an ounce of silver to the ton of 2,000 lbs. The quartz was of a white sub-translucent variety, seamed and in part stained with hydrated peroxide of iron.

The opportunities heretofore afforded for the searching after economical minerals in Hudson's Bay and Straits, have been few and very limited. For the most part they have been merely casual or else accessory to other explorations. From the examinations of the last few years, however, some idea may be formed of the general geological conditions of these regions and of the nature and distribution of the rock formations; and these were outlined in my report of last year, published by the Honourable the Minister of Marine and Fisheries. The localities, and, to some extent, the distribution of the more likely rocks to afford the precious metals having now been ascertained, and their actual presence, in a number of cases, demonstrated, further search may be more advantageously carried on, and there is little doubt these metals will hereafter be found in larger quantities in the above regions.

Notes on Icebergs and Field-Ice.

The phenomena relating to icebergs and field-ice are of so much interest and importance in various ways that some observations which I made on these subjects while connected with the Hudson's Bay Expeditions, and communicated to the Royal Society of Canada at its last meeting, may be considered worth embodying in the present report.

Icebergs.—During the last two summers, the writer, while accompanying the Government expeditions to Hudson's Strait, made by the steamships "Neptune" and "Alert," enjoyed excellent opportunities for observing icebergs, which, for weeks, were the most common objects to be seen from the vessels. A stream of bergs, several hundreds of miles wide and about two thousand miles long, comes constantly southward. These floating islands of ice are more abundant at some seasons than at others, but they are never absent. Upwards of one hundred may often be counted from a ship's deck at the same time. When we consider the mass of each of these innumerable bergs and the constancy with which they come floating on, we must be struck with the almost inconceivable amount of ice which is every year brought to the edge of the Gulf Stream. What becomes of this enormous quantity of ice? Most seamen will tell you it sinks on striking the warm waters. This, of course, is impossible, but the rapid disappearance of the bergs after reaching the banks of Newfoundland does not seem to have been fully accounted for. Up to this time they do not appear to have undergone any marked alteration or rapid reduction in size in the course of their voyage southward. When one happens to become stranded on the coast of Labrador or Newfoundland, it will remain for months, even under the summer sun, with but little diminution in bulk, until some day it starts off again with a high tide, and a strong wind favouring its departure.

The temperature of the interior of icebergs is probably a good deal below 32° Fah. While forming parts of glaciers in the Arctic regions, they have remained for ages at the low temperature of these high latitudes, and owing to their great mass, they would gain heat slowly in the short summers. It is well known that each berg is surrounded by a wide zone of cold water, and that in thick weather the proximity of one of them to a ship may be discovered by hauling a bucket of water on deck and testing it with a thermometer. As the berg moves south with the ocean current, it carries its chilly zone with it, like a planet surrounded by its atmosphere.

The Gulf Stream spreads itself on the surface of the Arctic Current, and towards its edge it is probably not deep. The berg, extending down to a great depth, is borne with comparative rapidity into the opposite-flowing warm surface-current. The zone of very cold water, which until now has remained around the berg, is immediately swept away, exposing its surface suddenly to a temperature, perhaps 30° Fah. warmer than it has ever experienced before. This rapid change would, no doubt, cause the ice to crack and fall to pieces in a very short time. The berg, lightened above, would rise, and so bring up new parts of the old ice to be acted upon by the warm water, which would always be increasing in depth. The fresh surface of the fragments of the berg, having the low temperature of its interior, would be immediately acted on in the same way, and these would, in their turn, become fractured over and over again, until the whole mass was reduced to a multitude of small pieces, floating on the surface of the warm water, with warm air above it. As they become scattered about, the process of fracturing, owing to the contrast in temperatures, would continue to go on, and thus every trace of the berg would quickly vanish. In order to test the behaviour of ice at a low temperature when suddenly immersed in warm water, the following experiment was performed in Ottawa on 27th February, 1885. A piece of ice, weighing about ten pounds, which had been freely exposed to the outer air, having then a temperature of 5° Fah., was brought into the house, wrapped in a fur rug to protect it from the heat, and plunged into a bath of water at a temperature of 87° Fah. Instantly, it began to crack in all directions, with distinct detonations, which could be heard in all parts of the room. In explanation of the fact that icebergs are occasionally met with far south of their usual limit, it may be suggested that these have been retarded by stranding or by gales of wind near the Newfoundland coast until their temperature has been raised; and that then, floating south-westward near the land, they have afterwards been carried out towards mid-ocean by the Gulf Stream.

It is supposed by some that icebergs have been the means of transporting vast quantities of earth and rocky materials from north to south in former geological times, and that this action is still going on. There does not, however, seem to be much foundation for such speculations. Out of the great number of bergs seen during the two voyages above referred to, only a few had any foreign matter, or even marks of discolouration upon them. It was remarked that towards the entrance to Hudson's Strait, cases of the kind were most frequent among the bergs furthest east. In the event of a berg carrying such matter, it would naturally become more visible as the surface melted by the sun's heat on coming south, and if any were present, it should be perceptible by the time the berg reached the latitude of Cape Race; yet, out of large number which may often be seen from the deck of an Atlantic steamer near this cape, it is very seldom that one is noticed carrying any earth or stones. It would, therefore, appear that icebergs have played only a small part in the transportation of boulders or earth during either Post-Pliocene or modern times.

Field ice.—This, which we had ample opportunities of observing on the two voyages referred to, appears to be a more important agent in the transport of earthly matter. The northern lands of the Dominion are so divided by the sea as to give an immense length of coast line. This is all favourable to the formation of the vast quantities of ice which encumber the shores in spring. In many parts where the land is high and steep, quantitities of dust and small pieces of rock are blown out upon the ice by the gales in winter. Landslides and avalanches precipitate coarser debris from the steep mountain sides upon the ice below. This is the case, especially, in the long fjords in Northern Labrador. In the spring, earth, gravel and stones are carried upon it by the torrents formed by the melting of snow. When the sun has loosened this ice sufficiently from the shore, the next spring tide carries it away. In shallow bays with high tides, such as Ungava Bay, the ice-pans which float in during the autumn and rest against the low shores, become impregnated with the sand and mud, which freeze to the sides at low tide and are incorporated in them as they increase in size during the winter. In the middle of summer, the surface having thawed, the whole of this ice becomes "foxy," as it is termed, or shows discolour-

ation. Many of the pans are completely covered with mud, sand, gravel and stones. Shells and sea-weeds may also be observed on some of them, and all have received more or less dust, which generally gives them a brownish or greyish colour. When a pan is suddenly overturned, this gives rise to a dense cloud in the clear sea water. Field ice would therefore appear to be a more important agent in transporting earthly matter than icebergs. It has been imagined by some that the smoothing and rounding of the rocks, which may often be observed on the shores of the Arctic and sub-Arctic regions, is largely due to a chafing action of ice of this class. There seems to be little ground, however, for this assumption. When the field-ice packs against the shore, it is seldom tossed by the waves of the sea, which are entirely broken down by a comparatively narrow field, so much so, that the sealing vessels are accustomed to run into such ice for shelter, and after they have penetrated a short distance, they are considered safe. Ice of this kind does not shove or pile itself on shore, pushing up the boulders and gravel in front of it, like the ice of our rivers when they break up in the spring. On the contrary, it always appears to lie quietly and easily against the shore. This is probably owing to the fact that the open spaces between the pans allow of a great amount of compression and adjustment, thus relieving the pressure, which is seldom directly against the shore. Indeed, it sometimes happens that the ice will unaccountably leave the shore against the wind.

Dr. Franz Boas of Berlin has observed that in Baffin Land the accumulation of ice in narrow channels, through which the tide sweeps, increases the strength of the current, which sometimes runs with great velocity. In one place, under such circumstances, he observed that the stones, boulders, and finer debris were set in motion and bored out what he calls giant-kettles in solid granite. Similar kettles were seen at this locality, high above the present sea level, showing that the same action had been going on in past ages. This observation recalled to the writer the fact that, more than twenty years ago, he noticed great pot-holes on the top of the high limestone cliffs on the east side of the isthmus separating Manitowaning Bay from South Bay on Manitoulin Island, Lake Huron. The surface of the rock in the vicinity is destitute of soil, but the earth which had accumulated in the bottoms of these pot-holes, supported trees, and these, growing out of the deep pits, presented a very curious appearance.

Notes on the Extraordinary Darkness of the 29th of August in Hudson's Bay and Straits.

Captain Gordon has referred to the phenomenal darkness which occurred on the night of the 29th of August when the "Alert" was in the vicinity of Cape Wolstenholme. So complete was the obscurity that it was impossible to see objects only a few inches from one's eyes. Mr. Woodworth reports from Digges Island that during the day the air had a smoky or hazy appearance, but it was not particularly marked and on the 29th a heavy rain, lasting from 3 to 11 p. m., had the effect of clearing the atmosphere.

Mr. Percy Woodworth, the observer at Laperrière's Harbour, on Digges Island, Station No. 6, informed me that after this rain, the streams near his station, which are usually very clear and bright, became perfectly darkened. He preserved for me the water which fell into his rain gauge, between the hours above mentioned, amounting to ·5 of an inch. This water which had a smoky appearance with a greenish yellow tinge, has been examined both miscroscopically and chemically with the following results: Mr. Joseph B. Tyrrell, of the Geological Survey reports that under the microscope it "swarmed with *Bacteria* of the genera *Spirillum*, *Bacterium* and *Bacillus*, and contained numerous small round unicellular algæ. At the bottom of the bottle were several masses of mycelial threads. Great numbers of small ciliate infusia were also swarming about through the water."

I am indebted to Mr. G. C. Hoffmann, chemist to the Geological Survey, for the chemical examination of the water. He reports as follows : —

"Results of a partial qualitative analysis of rain water that fell into rain-gauge

at Station No. 6, between the hours of 3 p. m., and 11 p. m. (about) on the 29th day of August, 1886.

"The amount 60 c.c., of water was far too small to admit of any quantitative determinations. As handed to me it had a greenish-yellow colour, a mouldy smell and contained a good deal of suspended matter, apparently organic.

"The suspended matter having been examined by Mr. J. B. Tyrrell, was on this occasion disregarded. It was filtered off. The filtered water was examined by Mr. E. B. Kenrick and found to contain very small quantities of the following acids and bases:

"Acids—Hydrochloric, nitrous.

"Bases—Potash, soda, ammonia, lime.

"Note I.—Changes had, doubtless, occurred in the water since the time of its collection.

"Note II.—(1) Nitric acid is commonly present in rain-water, chiefly in combination with ammonia. (2) Nitrous acid is also present in rain-water. (3) Rain-water, perhaps always, contains a small amount of organic substance. (4) Rain-water sometimes contains a very small amount of hydrochloric acid, sodium or calcium chloride and other saline substances."

I have received a letter from Mr. William Woods, meteorological observer at York Factory, on the opposite side of Hudson Bay, dated 10th December, 1886, in which he remarks: "At York, on 28th August, we had great darkness, partly owing to the smoke that was around; but we had very little wind till Monday the 30th, when we had a gale of considerable force. We had a very high tide, fully 10 feet above the highest tide that I have seen at York Factory, with one exception, and then the tide exactly rose to the same height, namely, 10 feet above an ordinarily high tide."

It may be interesting to remark, in connection with this subject, that in the region around Hudson Bay, or between it and the Great Lakes, almost every year since 1869 I have observed a marked disturbance in the weather about the end of August or beginning of September, generally accompanied by a hazy atmosphere and either rain or snow, the latter always disappearing again. Immediately after these snow-falls a distinct smell, like that of ozone, could always be perceived in the woods. Letters afterwards received from the interior of the Labrador peninsula gave accounts of corresponding weather which had been experienced there two or three days later than in the country west of James' Bay.

List of Plants from Nottingham Island, Hudson's Straits.

Collected by Mr. John McKenzie, B.A.Sc., Observer at Station No. 5, and determined by Professor J. Macoun, Botanist of the Geological Survey.

1. Ranunculus nivalis, Linn.
2. Draba Alpina, Linn.
3. do var. glaciatis, Dickie.
4. Entrema Edwardsii, R. Br.
5. Silene acaulis, Linn.
6. Lychinis apetala, Linn.
7. Stellaria longipes var. Edwardsii, T. & G.
8. Cerastium Alpinum, var. Fischerianum, T. & G.
9. Astragalus Alpinus, Linn.
10. Dryas actopetala, var. integrifolia, Cham. & Schulet.
11. Saxifraga oppontifolia, Linn.
12. do caspitosa, Linn.
13. do rivularis, Linn.
14. do cernua, Linn.
15. do Hirculus, Linn.
16. do tricaspidata, Retz.
17. do aizoides, Linn.

18. Epilobium latifolium, Linn.
19. Erigeron uniflorus, Linn.
20. Crysanthemum integrifolium, Richards.
21. Matricaria involuera, var. nana, Hook.
22. Vaccinium uliginosum, Linn.
23. Cassiope tetragona, Don.
24. Pyrola rotudifolia, var. pumila, Hook.
25. Mertousia maritima, Don.
26. Pedicularis hirsuta, Linn.
27. Polygonum viviparum, Linn.
28. Oxgria digyna, Campera.
29. Empetrum nigrum, Linn.
30. Salin arctica, R Br.
31. do herbacea, Linn.
32. Salix chlorophylla, Anders.
33. do reticulata, Linn.
34. Luzula spicota, Deav.
35. Carex saxatilis, Linn.
36. Alopieurus Alpinus, Smith.
37. Festuea ovina, var. brevifolia, S. Wat.
38. Dupontia Fischeri, R. Br.
39. Arctagrootis latifolia, Gris.
40. Trisetum subspicatum, var. motle, Gray.
41. Equisetum scirpoides, Michx.
42. do arvense, var. seritimus.
43. Lycopodium Lelago, Linn.
44. Ptilota serrata, Kütz.

ROBERT BELL.

GENERAL REMARKS ON THE NAVIGATION OF HUDSON BAY AND STRAITS.

Having now made voyages on three years to Hudson Straits, and having carefully examined the reports by the observers as to the formation and movements of the ice in Hudson Straits, I have the honour to submit the following statement in regard to the navigation of these waters.

In discussing this question I think it well to state that I am not required to report on the commercial aspect of the case, and whether Hudson Straits navigation can be made to pay, nor do I, in the seasonal limits given, mean to state that it is impossible for a ship occasionally to get in earlier or leave later; but having carefully considered the subject, I give the following as the season during which navigation may, in ordinary years be regarded as practicable for the purposes of commerce; not, indeed, to the cheaply built freight steamer, commonly known as the "Ocean Tramp," but to vessels of about 2,000 tons gross, fortified for meeting the ice, and of such construction as to enable them to be fair freight carriers. These vessels must be well strengthened forward; should have wooden sheathing, and be very full under the counter; the propeller should be of small diameter and be well down in the water. I place the limit of size at about 2,000 tons, because a larger ship would be somewhat unwieldy, could not make such good way through the loose ice; and being unable to turn so sharply she would get many a heavy blow, that the smaller ship would escape.

I consider that the season for the opening of navigation to such vessels as the above will, on the average, fall between 1st and 10th July. The position and movements of the ice I have already discussed, and need not here repeat. The closing of the season would be about the first week in October, partly on account of the descent of old ice from Fox Channel into the western end of the Straits; this old ice being

rapidly cemented into solid floe by the formation of young ice between the pans; in such ice, no ship, however powerful, could do anything to free herself. At this time, too, the days are rapidly shortening, and snowstorms are frequent though not of great duration.

The tidal currents in Hudson Straits add very considerably to the risks of navigation. These currents vary in velocity from three to six knots per hour, and the uncertainty of this effect on ships has already been pointed out in the case of the "Fury" and "Hecla." I have myself, when fast in the ice in thick weather, tried the ground log, and have made out apparently the rate and direction in which we were being carried, but in almost every instance, when we began to haul in the line, it fouled some spur of ice beneath, and weights and line together would be lost.

The last, and indeed the most serious, difficulty that I anticipate is in the faulty working of the compasses, especially about the critical ground off Digges Island. Mansell Island can, under most circumstances, be kept clear of by the lead, but in the neighbourhood of Digges Island nothing but the most sleepless vigilance and the greatest caution will save a ship from disaster.

Steamships built for the Hudson Bay trade would be constructed largely of iron; and while it is admitted that it is theoretically possible to perfectly compensate and adjust a ship's compass, so that it shall (provided the magnetic condition of the ship remains unchanged) remain in adjustment, no matter what magnetic latitude the ship may be in, in practice it is found not only impossible to so perfectly adjust the standard compass of an iron ship, but that even supposing this to be done almost perfectly, the magnetic condition of the ship is subject to changes, both extensive and frequent, arising from so many and widely various causes, that only repeated observations for compass error can ensure safety.

At the western end of Hudson's Straits we are approaching the Magnetic Pole, the dip being 86° at Digges Island. This means great vertical force with the horizontal force approaching the vanishing point. The horizontal force may be considered as that portion of the earth's magnetic force which determines the direction of the magnetic needle, when counterpoised so as to hang horizontally; the vertical force is that which by induction in the iron of the ship to a great extent affects the deviation or ship errors. In making a voyage from the United Kingdom to Hudson's Bay, the dip changes from 67° to 87° nearly. The practical meaning of this is that supposing a residual error of 1° left under corrected on one of the cardinal points, when adjusting at Liverpool, this would, inasmuch as the deviation changes, roughly speaking, with the tangent of the dip, have become an error of 6° when the ship had gone to a place where the dip was 87°.

Further, in an iron ship any severe concussion changes the magnetic condition of the ship, hence when working through ice constant changes would be taking place in the ship's attraction, and, consequently, in the compass errors.

I am further of opinion that in an iron ship, making the voyage between, say Liverpool and Hudson's Bay, on arrival off the western end of the Straits, the compass will not work.

Altogether I consider the navigation of Hudson's Straits as being more than ordinarily difficult, with shores inhospitable and bleak, presenting such a picture of loneliness and desolation, that it takes some time to get accustomed to it. The only safety in thick weather lies in the constant use of the lead and keeping a bright lookout, as the dead-reckoning is frequently in error to a considerable extent.

Surveying.

I have already noticed the work done at York and Churchill this year, and plans of these places accompany this report. In addition to this, the geographical position of several points has been determined, and short pieces of coast line outlined as opportunities were afforded in the course of the voyage. Copies of the charts and plans, together with the results of tidal observations, will be forwarded hereafter.

Before closing my report, I desire to acknowledge the highly satisfactory way in which every officer and man belonging to the ship and expedition performed their duties. Strict discipline was maintained on board, and the work which was frequently most labourious was at all times performed with alacrity and cheerfulness.

As to future work on Hudson's Straits and Bay I have already pointed out in the portion of the report dealing with the resources of the region, that it is desirable a Government vessel should annually visit that region for the purpose of regulating the fisheries, &c.; such a vessel enabling the surveying work to be continued for one or two more seasons would go far to make the charts sufficiently accurate for the recognition of the coast line, and would probably also get a large amount of valuable sounding work done in this western end of the Straits, where it would be of the greatest value to navigation.

I have now to conclude this my third report on Hudson's Bay work, and trust that my endeavours to carry out your instructions, and the discussion of the results of our observations, may meet with your approval.

All of which is respectfully submitted

By your obedient servant,

ANDREW R. GORDON,
Lieut. R. N., Comd'g H. B. Expedition.

METEOROLOGICAL OBSERVATIONS.

TABLE I.—ABSTRACT of Meteorological Observations at Belle Isle, Labrador,

Months.	Temperature.					Amount of Sky Clouded 0-10.	Rain.		Days of Snow.	Whole No. of Observations.	N.	N.E.
	Average.	Average of Max. and Min.	Highest Temperat.	Lowest Temperat.	Mean Daily Range.		Amount.	Days of				
1885.	°	°	°	°	°							
October	36·19	35·89	49·0	25·0	6·07	7·2	1·85	8	5	84	7	3
November	27·20	27·52	40·0	— 3·0	8·23	6·9	3·77	4	6	90	10	15
December	12·33	12·21	39·0	—12·0	6·38	6·9	1·73	4	11	93	9	8
1886.												
January	14·71	14·58	40·0	—15·0	8·26	7·6	2·53	9	13	93	8	14
February	11·55	11·34	39·0	—11·0	8·90	6·8	0·30	4	14	84	19	15
March	16·54	16·54	39·0	—14·0	9·03	7·0	1·83	6	14	93	10	37
April	25·16	24·55	40·0	2·0	9·36	6·0	0·14	9	9	87	12	25
May	37·59	38·18	59·0	19·0	7·26	6·9	3·41	10	5	80	2	8
June	47·21	47·24	59·0	33·0	8·73	7·5	6·56	14	......	90	3	10
July	49·97	50·37	62·0	34·0	8·48	8·2	10·73	18	......	86	5	4
August	46·78	47·26	56·0	39·0	7·09	6·8	4·51	5	......	72	3	8
September	41·71	42·17	50·0	30·0	5·80	7·1	2·01	10	3	90	5	10
Year	30·58	30·65	62·0	—15·0	7·80	7·1	39·37	101	80	1042	93	137

Lat. 51° 53′ N., Long. 55° 22′ W., from October, 1885, to September, 1886.

Direction of Wind.							Velocity of Wind.						Fogs.	
								No. of Times the Velocity was						
E.	S.E.	S.	S.W.	W.	N.W.	Calms.	Average Velocity.	20 Miles.	30 Miles.	40 Miles.	50 Miles.	60 and upwards.	No. of Days.	No. of Hours.
1	4	2	27	20	18	2	14·7	15	5	4	4	3	13	152
1	7	0	17	6	34	0	20·5	30	6	3	9	0	7	88
6	4	4	20	22	20	0	18·0	21	10	7	4	1	2	32
6	9	3	21	10	22	0	15·0	19	8	3	0	6	12	168
6	2	1	6	20	13	2	15·0	21	12	5	2	0	8	144
9	3	0	7	15	12	0	17·0	22	7	11	2	1	17	312
8	3	0	8	14	15	2	14·3	16	8	6	3	0	2	24
6	18	1	14	17	11	3	7·0	8	3	2	0	0	12	216
16	11	8	10	24	6	2	10·0	17	3	3	1	0	16	248
12	10	2	14	26	13	0	10·0	14	3	1	1	1	25	368
8	1	2	12	30	8	0	14·5	16	6	7	4	0	10	104
3	1	3	17	36	15	0	11·0	23	3	1	0	0	12	136
82	73	26	173	240	187	11	15·92	222	74	53	30	12	136	1992

TABLE II.—Abstract of Observations taken at Port Burwell, Station No. 1, 1st

Months.	Barometer. Mean.	Barometer. Highest Obs.	Barometer. Lowest Obs.	Barometer. Range.	Temperature. Mean.	Temperature. Highest Obs.	Temperature. Lowest Obs.	Temperature. Mean of Warmest Day.	Temperature. Mean of Coldest Day.	Temperature. Mean Max.	Temperature. Mean Min.	Temperature. Range.
1885.												
October	29·838	30·312	28 918	1·394	29·99	42·0	15·5	35·97	18·83	32·60	28·00	4·60
November ...	30·002	·454	29·360	1·094	22·28	36·0	— 6·0	33·90	1·83	25·84	18·91	6·93
December....	29·707	·604	28 706	1·898	4·80	33·5	—23 0	25·30	—22·70	8·86	— 1·96	10·82
1886.												
January......	30·034	·750	29·215	1·535	—11·48	17·8	—31·0	12·93	—28·05	—5·53	—18·14	12·61
February	29·823	·015	28·479	2·536	—10·43	27·8	—32 2	35·48	—27·43	—4·11	—15·97	11·86
March	·900	·568	28·755	1·813	— ·12	36·2	—24·4	33·43	—20·57	4·77	— 5·53	10·30
April..........	·940	·504	29·244	1·260	14·54	39·0	—12·4	34·60	— 6·77	18·49	9·79	8·70
May......	·851	·230	29·429	·801	28·03	47·0	10·0	42 07	14·75	31·75	23·68	8·07
June..........	·770	·244	28 863	1·381	35·53	45·2	29·0	40·53	32·32	38·65	32·14	6·51
July............	·783	·106	29·449	·657	41·56	56·0	31·0	50·70	33·70	45·84	36·82	9·02
August........	·703	·106	29·219	·887	40·68	67·4	31·8	54·47	35·55	44·54	36·69	7·85
September...	·732	·174	29·204	·970	32·52	45·5	27·0	41·92	30·06	37·84	33·41	4·43
Year.........	29·840	30·422	29·070	1·352	18·13	67·4	—32·2	54·47	—27·43	23·29	14·82	8·47

October, 1885, to 31st September, 1886, inclusive.—Observer, Mr. G. R. SHAW.

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind. Highest Velocity.	Wind. Highest Daily Mean.	Wind. Mean Hourly Velocity.	Cloudiness to Tenths.	Rain. Depth in Inches.	Rain. Duration in Hours.	Snow. Depth in Inches.	Snow. Duration in Hours.	Days Auroras Reported.
·145	92·5	26·6	45	33·3	11·8	8·1	·2	18	2·0	60	4
·108	88·8	20·2	65	45·0	11·7	8·8	·2	18	8·0	34	4
....	....	....	80	45·5	13·9	6·8	....	....	26·0	58	6
....	....	....	65	53·3	24·3	4·6	....	....	6·0	8	10
....	....	....	68	58·8	20·8	4·9	....	....	3·0	36	15
....	....	....	55	33·7	15·9	3·4	....	....	4·0	31	15
·091	89 8	13·2	60	48·3	17·4	7·5	....	....	S.	3	3
·131	86·1	23·3	60	39·2	15·4	7·3	....	....	S.	9	8
·198	91·8	33·3	60	48·3	14·0	8·2	·69	14	15·0	15	3
·214	84·1	36·8	67	56·5	17·7	5·0	1·34	8	....	....	14
·224	84·4	37·2	55	49·2	13·1	6·6	2·04	16	....	....	3
·145	84·4	30·4	60	47·0	10·8	6·9	2·12	12	....	34	4
....	87·74	....	80	58·8	15·48	6·5	6·59	86	64·0	288	89

TABLE III.—Abstract of Observations taken at Ashe Inlet, Station No. 3, 1st Sept.

Months.	Barometer.				Temperature.							
	Mean.	Highest Obs.	Lowest Obs.	Range.	Mean.	Highest Obs.	Lowest Obs.	Mean of the Warmest Day.	Mean of the Coldest Day.	Mean Max.	Mean Min.	Range.
1885.												
September...	29·763	30·21	28·75	1·46	33·68	45·9	21·7	41·12	25·56	37·43	30·19	7·24
October......	·802	·36	29·41	·95	25·54	35·1	11·7	32·87	15·72	28·55	20·70	7·85
November...	30·062	·41	·57	·84	13·61	27·8	—15·0	24·35	— 11·22	18·41	7·47	10·94
December....	29·667	·17	28·61	1·56	— ·14	29·8	—25·3	23·08	— 20·93	5·56	— 5·29	10·85
1886.												
January......	30·004	·85	29·01	1·84	—19·34	6·4	—33·2	3·52	— 29·02	—13·25	— 25·29	12·04
February....	29·824	·95	28·60	2·35	—19·27	16·8	—38·1	4·33	— 34·52	—15·24	— 25·44	10·20
March.........	·889	·70	·99	1·71	— 7·96	22·4	—26·9	16·83	— 23·82	— 1·54	— 16·37	14·83
April.........	·982	·47	29·51	·96	8·37	28·8	—15·0	25·32	— 9·65	12·90	1·71	11·19
May...........	·795	·29	·27	1·02	24·64	38·3	2·8	36·77	9·25	28·53	19·17	9·36
June..........	·811	·23	·13	1·10	36·62	46·1	27·5	41·38	33·08	41·31	31·58	9·73
July...........	·781	·10	·46	·64	41·08	35·0	32·8	47·33	35·03	45·56	35·72	9·84
August.......	·669	·07	·11	·96	40·23	55·2	30·9	49·53	35·63	44·79	34·61	10·18
Year.....	29·837	30·95	28·60	2·35	14·755	55·2	—38·1	49·53	— 34·52	19·42	9·06	10·36
September...	29·604	30·08	28·96	1·08	34·51	40·7	31·1	38·08	32·73	37·37	31·75	5·62

1885, to 15th September, 1886, inclusive.—Observer, J. W. Tyrell, Esq., P.L.S.

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind.			Cloudiness to Tenths.	Rain.		Snow.		Days Aurora Reported.
			Highest Velocity.	Highest Daily Mean.	Mean Hourly Velocity.		Depth in Inches.	Duration in Hours.	Depth in Inches.	Duration in Hours.	
·163	81	....	60·	49 3	15·84	7·2	....	....	3·	13	5
·130	87	....	43·	34·3	14·12	7·4	·1	10	1·	48	4
·079	76	....	38·	33·0	16·02	6·1	....	....	7·	39	7
·047	87	....	50·	41·0	17·15	6·1	....	....	14·	86	7
·015	....	....	50·	30·8	14·50	3 2	....	....	12·	48	3
·018	....	....	70·	38·0	14·29	3·3	....	....	9·	40	13
·033	....	....	46·	32·5	11·10	2·8	....	....	1·	8	11
·070	94	....	48·	26·3	16 57	5.3	....	....	6·	30	16
·134	94	....	44·	32·3	16·53	8·5	1·23	43	12·	52	7
·184	85	....	45·	31·2	14·95	6·2	·18	15	3·	20	....
·214	84	....	36·	30·3	16·12	7·4	1·24	57	....	....	....
·221	88	....	38·	31·0	11·73	7·8	3·46	158	....	....	3
·109	87	....	70·	49 3	14·91	5·94	6·21	283	68·	384	76
·179	88	....	58·	52 0	19·52	8·4	·81	16	·75	12	3

TABLE IV.—Abstract of Observations taken at Stupart's Bay, Station No.

Months.	Barometer at 32°, Sea Level.				Temperature.							
	Mean.	Highest Obs.	Lowest Obs.	Range.	Mean.	Highest Obs.	Lowest Obs.	Mean of Warmest Day.	Mean of Coldest Day.	Mean Maximum.	Mean Minimum.	Range.
1885.												
September......	....	....	....	....	33·32	46·9	4·8	37·8	24·9	36·04	26·95	9·09
October	29·768	30·337	29·393	·944	25·02	35·7	0.5	32·2	9·1	29·46	17·00	12·46
November.....	30·042	30·381	29·462	·919	15·45	27·8	—8·0	26·2	— 4·0	19·94	8·50	11·44
December	29·625	30·459	28·608	1·851	— 2·43	30·1	—28·5	23·5	—22·8	4·54	—10·13	14·67
1886.												
January	29·990	30·809	29·064	1·745	—21·48	10·9	—37·3	3·0	—32·7	—15·12	—27·80	12·68
February	29·807	30·900	28·724	2·176	—20·39	11·5	—39·5	2·0	—35·1	—14·91	—26·72	11·81
March............	29·871	30·653	28·946	1·707	— 6·75	23·2	—31·8	13·0	—26·7	0·28	—15·06	15·34
April	29·959	30·487	29·513	·974	10·49	40·8	—18·9	29·6	—10·9	16·77	2·84	13·93
May...............	29·754	30·338	29·133	1·205	24·87	45·4	0·8	38·0	8·0	30·07	18·23	11·84
June	29·792	30·213	29·174	1·039	38·62	60·3	26·5	50·4	32·9	43·84	33·60	10·24
July	29·749	30·691	29·366	·725	41·28	68·0	30·5	51·9	34·0	48·55	35·06	13·49
August	29·655	30·070	29·093	·977	42·55	66·5	29·0	53·6	35·0	49·16	35·77	13·39
Year.......	....	30·900	28·608	2·292	15·044	68·0	—39·5	53·6	—35·1	20·72	8·19	12·53
Sept'r, 15 days	29·593	30·070	28·971	1·099	35·97	50·4	21·4	39·3	31·9	41·00	31·64	9·36

4, 1st September, 1885, to 15th September, 1886.—Observer, F. F. Payne.

Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind. Highest Velocity	Wind. Highest Daily Mean.	Wind. Mean Hourly Velocity.	Mean Cloudiness 0 to Tenths	Rain. Duration in Hours.	Rain. Depth in Inches	Snow. Duration in Hours.	Snow. Depth in Inches.	Number of Auroras.	Duration of Fog in Hours.
·167	86·0	29·5	55	33·2	13·3	7·4	58	·35	86	11·4	9	57
·126	89·7	23·5	30	28·7	11·3	7·2	12	·15	110	28·6	11	13
·084	91·6	....	30	24·8	13·4	6·4	....	....	105	23·0	5	....
·045	97·3	....	53	41·2	12·8	4·4	....	....	144	35·1	16	10
....	....	....	50	32·2	12·7	3·9	....	....	95	10·2	13	60
....	....	....	60	47·7	13·6	3·3	....	....	113	11·9	13	43
·034	93·4	....	48	43·5	9·5	3·9	....	....	76	11·9	17	74
·072	90·7	....	52	40·3	13·0	6·0	7	·26	139	11·3	8	35
·124	86·5	21·7	27	18·5	9·3	6·9	63	1·29	86	9·5	4	59
·189	81·6	32·9	40	32·0	11·6	6·1	62	1·15	45	7·5	....	68
·218	84·2	36·4	25	15·5	4·6	7·0	19	·39	....	....	....	147
·225	82·8	37·3	45	32·7	9·0	6·6	56	1·69	....	....	7	40
·1284	88·38	30·22	60	47·7	11·2	5·76	277	5·28	999	160·4	103	606
·173	81·7	30·8	50	38·2	12·4	7·0	30	1·27	3	·2	3	1

TABLE V.—Abstract of Observations taken at Port de Boucherville, Station No. 5,

Months.	Barometer, corrected, Sea Level. Mean.	Highest Obs.	Lowest Obs.	Range.	Temperatures. Mean.	Highest Obs.	Lowest Obs.	Mean of Warmest Day.	Mean of Coldest Day.	Mean Maximum.	Mean Minimum.
1885.											
September....	29·850	30·162	29·002	1·160	32·14	41·0	13·0	38·01	23·00	35·55	26·93
October	·847	·537	·317	1·220	23·04	32·8	— 2·2	30·93	3·83	26·24	17·59
November	30·150	·442	·812	0·630	14·46	27·3	— 9·9	25·82	— 9·22	18·93	8·06
December.....	29·683	·382	28·582	1·800	— 6·60	29·3	—32·8	18·30	—28·02	— 0·04	—14·73
1886.											
January.......	29·987	30·767	29·327	1·440	—24·43	8·0	—38·2	0·70	—35·02	—19·24	—30·90
February......	·858	·842	28·990	1·852	—26·17	—2·6	—44·7	— 5·18	—40·05	—22·31	—33·08
March..........	·901	·642	29·131	1·511	—10·96	16·8	—38·1	12·46	—31·93	— 5·60	—18·76
April	30·044	·617	·532	1·085	6·22	28·1	—21·2	23·45	—13·20	11·73	—2·21
May............	29·742	·342	·082	1·260	22·70	41·8	0·8	35·85	6·03	27·09	16·91
June...........	·869	·332	·312	1·020	37·37	54·8	28·2	45·03	32·60	43·07	32·14
July	·740	·057	·415	0·642	39·07	59·7	32·1	45·45	34·77	45·23	34·39
August........	·664	·070	28·932	1·138	39·07	60·3	31·2	44·46	34·55	45·08	34·54
Year............	29·861	30·842	28·582	2·260	12·16	60·3	—44·7	45·45	— 40·05	17·14	5·91

1st September, 1885, to 1st September, 1886—Observer, Mr. JOHN McKENZIE, C.E.

Range.	Pressure of Vapour.	Relative Humidity.	Dew Point.	Wind.			Cloudiness to Tenths.	Rain.		Snow.		Number of Days Auroras Reported.
				Mean Hourly Velocity.	Highest Daily Mean.	Highest Velocity.		Duration in Hours.	Depth in Inches.	Duration in Hours.	Depth in Inches.	
8·62	·1584	85·92	28·38	13·28	39·72	56·0	6·8	19·8	0·243	55·5	2·5	10
8·65	·1158	89·57	20·51	8·47	21·82	29·4	7·9	....	....	80·5	18·5	16
10·86	·0826	92·58	12 79	12·09	29·36	42·0	6·7	....	....	87·5	14·5	24
14·70	·0353	95·11	....	11·80	26·65	41·6	5·9	....	....	203·1	30·5	13
11·66	·0131	....	....	12·03	32·40	45·5	4·2	....	....	77·5	11·0	16
10·76	·0111	....	....	8·73	46·95	70·0	4·4	....	....	71·0	5·0	19
13·16	·0304	....	....	11·67	28·85	35·5	4·8	....	....	56·5	6·0	15
13·94	·0604	92·93	....	11·22	27·36	35·4	5·9	....	....	49·0	8·0	9
10·19	·1216	93·05	20·89	14·52	39·16	58·0	9·3	12·25	0·428	114·0	16·8	....
10·93	·1824	82·17	32·13	9·51	21·83	33·0	6·3	31·00	0·492	14·6	....	....
10·84	·2003	84·73	34·59	10·92	21·32	30·0	7·7	72·30	1·786	*	....	1
10·54	·2063	86·59	35·21	9·70	20·92	29·3	6·6	70·25	2·517	....	....	11
11·24	·1015	89·18	....	11·162	46·95	70·0	6·375	205·6	5·466	809·2	112·8	134

* Only a trace of snow.

Table VI.—Abstract of Observations at Digge's Island, Latitude 62° 34·33
August, 1886.—Observer,

Months.	Barometer (corrected to Temp. 32° and to Sea Level.)				Temperatures.						
	Mean.	Highest.	Lowest.	Range.	Mean.	Highest.	Lowest.	Mean of Warmest Day.	Mean of Coldest Day.	Mean Max.	Me Min.
1885.											
September....	29·7390	30·107	28·658	1·449	33·84	51·9	18·9	43·36	25·78	37·46	30·14
October	29·7503	30·466	29·187	1·279	25·44	36·7	5·9	34·71	14·06	28·43	21·86
November.....	30·0568	30·346	29·740	·606	16·52	27·7	— 8·7	25·91	— 6 05	20·54	11·37
December.....	29·6365	30·396	28·418	1·978	— 5·93	23·3	—31·1	20·20	—25·68	— 0·12	—11·18
1886.											
January	29·9979	30·752	29·436	1·316	—25·39	5·4	—37·6	— 0·91	—35·68	—20·50	—31·08
February	29·8615	30·847	29 008	1·839	—25·49	2·9	—40·4	— 1·88	—36·38	—21·24	—31·09
March	29·8838	30·674	29·097	1·577	—10·77	21·6	—38·3	15·51	—34·16	— 4·96	—17·46
April...........	30·0141	30·638	29·408	1·230	7·48	30·4	—19·0	25·01	—12·10	13·66	0·62
May	29·7088	30·395	29·062	1·333	22·85	39·4	0·9	34·81	6·30	27·87	17·62
June............	29·8484	30·365	29·177	1·188	35·86	49·5	27·9	39·71	31·95	40·27	31·15
July	29·7068	30·066	29·344	·722	40·09	60·8	29·7	53·78	33·18	46·05	34·14
August........	29·6448	30·102	28·786	1·316	39·26	54·9	31·3	44·45	35·31	43·91	34·82
Year	29·82072	30·847	28·418	2·429	12·81	60·8	—40·4	53·78	36·38	17·61	7·57

North, Longitude 78° 1′ West, Station No. 6, 1st September, 1885, to 31st
P. C. Woodworth.

Range.	Pres e of Vapour.	Relative Humidity.	Dew Point.	Wind. Mean Hourly Velocity.	Wind. Highest Daily Mean.	Wind. Highest Velocity.	Cloudiness to Tenths	Rain. Duration in Hours.	Rain. Depth in Inches.	Snow. Duration in Hours.	Snow. Depth in Inches.	No. of Days Auroras Reported	Fog. Duration in Hours.
7·32	·1696	85·16	29·87	18·24	40·50	53	7·33	3	·030	58	12	5	80
6·56	·1240	86·93	22·22	13·22	29·33	37	8·38	....	....	77	15	4	12
9·17	·0868	89·94	14·94	17·28	42·33	49	6·91	....	....	40	2½	12	28
—11·05	·0348	89·26	....	19·22	43·66	48	6·84	....	....	57	11⅓	8	....
—10·58	....	....	....	15·88	32·66	43	4·14	....	....	5	1	20	*
— 9·58	....	....	....	13·77	35·50	44	4·46	....	....	19	5	14	*
—12·50	....	....	....	16·11	35·83	48	5·01	....	....	95	16	17	8
13·02	....	....	....	13·91	26·33	40	7·13	....	....	94	12	7	16
10·24	·1210	93·99	21·40	18·90	40·33	58	9·49	....	....	132	36	....	76
9·12	·1852	88·28	32·51	9·82	25·16	30	6·96	28	·590	....	....	....	124
11·91	·2246	89·69	37·06	10·83	30·50	40	8·27	90	3·480	....	....	....	188
9·09	·2203	91·81	36·91	12·36	38·33	48	7·11	44	2·420	....	....		208
10·03	....	....	....	14·96	43·66	58	6·83	165	6·520	577	111	94	740

* A great deal of vapour around horizon for January and February.

TABLE VII.—Abstract of Meteorological Observations at Fort Churchill, Hudson Bay, Lat. 58° 43' N., Long. 94° 10' W., from September, 1885, to 14th August, 1886, inclusive.—Observer, JOHN B. SPENCER.

Months.	Barometer at 32°.				Temperature.					Average Pressure of Vapour.	Average Relative Humidity.	Wind.					Rain.		Snow.		No. of Fogs.	No. of Auroras	No. of Thunder Storms.	Average Cloudiness.
	Average.	Highest.	Lowest.	Range.	Average.	Highest.	Lowest.	Average of Warmest Day.	Average of Coldest Day.			Prevailing Direction.	Total Mileage.	Average Hourly Velocity.	Average of most Windy Day.	Average of least Windy Day.	Amount.	Days.	Amount.	Days.				
1885.					°	°	°	°	°															
September...	29·678	30·144	29·153	0·991	39·37	60·5	29·0	51·17	30·50	0·208	85	E.....	8,169	12·61	24·67	2·92	6·18	20	0·5	2	4	1	...	9·5
October	29·914	30·347	29·256	1·091	23·66	53·0	— 4·0	38·00	— 2·67	·109	79	N.W........	8,508	13·13	30·71	1·13	0·55	3	4·0	7	2	4	1	8·7
November ...	30·013	30·406	29·467	0·889	16·49	33·0	—17·0	28·00	—10·67	·081	80	N.E.-S.W..	3,783	5·98	19·09	0·38	R	1	22·5	5	9	3	...	7·6
December ...	29·857	30·456	28·918	1·538	— 8·26	39·0	—36·0	31·33	—32·00	....	......	N.W.......	8,873	11·93	39·75	1·17	R	1	5·0	6	4	3	...	7·8
1886.																								
January.....	30·156	30·820	29·702	1·118	—27·64	9·0	—45·0	—2·00	—41·67	.. ..	. ....	N.W..	5,969	8·02	24·29	0·00	....	...	....	...	3	12	...	3·1
February	30·125	30·658	29·098	1·560	—20·68	7·0	—39·0	—4·33	—55·00	....	......	N.W........	4,615	6·87	35·08	0·17	....	...	2·5	3	0	7	...	2·9
March	30·045	30·581	29·263	1·318	— 8·40	29·9	—37·0	20·33	—32·67	....	.....	N.W.-S.E.	5,972	8·03	27·46	0·00	....	...	3·5	2	0	9	...	3·8
April	30·085	30·550	29·285	1·265	16·41	44·0	—16·0	33·00	—12·00	·078	72	N.W.-E....	5,141	9·31	23·25	0·83	0·27	4	9·0	1	2	4	...	6·4
May	29·903	30·433	29·170	1·263	24·38	52·1	— 2·0	35·67	3·00	·114	78	N.W.-E....	8,456	11·37	32·04	0·88	0·52	2	1·4	6	0	0	..	8·1
June	29·908	30·237	29·382	0·855	43·07	82·0	30·0	71·67	33·33	·277	91	E.-N.W...	3,942	5·48	12·96	0·42	1·32	8	5·0	5	3	0	2	5·1
July...........	29·771	30·203	29·209	0·994	56·94	80·0	40·0	66·33	43·33	·368	83	N.W.-N.E.	3,584	5·15	15·63	0·83	2·36	19	......	...	1	0	5	6·2
Aug. to 14th	29·853	30·173	29·609	0·564	52·06	74·0	40·0	65·77	43·33	·299	75	N.W.-N....	....	8·10	12·83	4·17	0·32	7	......	...	2	1	2	6·4
Year.	....	....	....	....	....	....	....	....	....	....	......	....	....	....	....	......	.....	...	......	...	...	...	...	......

TABLE VIII.—Mean daily temperature, October, 1885, to March, 1886, at Fort Chimo, Labrador, Latitude , Longitude , from observations at 7 a.m. and 8 p.m., with the monthly average, and the highest and lowest from the observed readings, advantage being taken of occasional observations at 2 p.m. daily.

Day.	October.	November.	December.	January.	February.	March.
	°	°	°	°	°	°
1	35·0	7·5	— 2·0	— 9·0	5·0	27·5
2	35·0	3·0	17·5	— 8·5	—20·0	25·0
3	33·5	5·0	7·5	5·0	—23·5	20·0
4	33·5	12·5	— 7·5	1·0	—29·0	12·5
5	31·0	16·0	—10·0	—16·0	—26·0	9·5
6	31·0	21·5	— 9·0	—26·0	—29·5	6·0
7	28·5	22·0	— 6·0	—15·5	—27·5	0·0
8	26·5	23·0	— 7·0	—14·5	—39·0	—13·0
9	28·5	22·5	— 7·0	—21·0	—37·5	—21·5
10	30·5	18·5	— 7·0	—15·5	—33·0	— 5·0
11	32·0	31·0	—10·0	—15·0	—31·0	—30·0
12	23·0	33·0	—10·0	—23·5	16·5	—35·5
13	20·5	32·0	—12·0	—26·0	19·0	—35·5
14	32·0	19·0	— 4·0	—26·5	25·0	—36·5
15	36·0	32·0	—10·0	—26·0	—17·5	—36·5
16	35·0	28·5	— 9·5	—20·0	—16·5	—14·0
17	35·5	26·0	—13·0	—17·5	—16·5	—11·0
18	38·0	21·0	—18·0	— 9·5	—29·0	— 5·0
19	38·0	18·0	—18·0	—21·0	—30·0	— 9·0
20	35·0	11·0	—19·0	—19·0	—38·0	— 1·0
21	31·5	12·5	—18·0	—29·5	—39·0	0·0
22	30·0	6·5	—20·0	—26·0	—37·5	— 1·0
23	29·5	9·0	—22·5	2·0	—37·0	— 3·0
24	29·0	17·5	—26·0	—26·0	—32·5	— 2·0
25	25·0	2·5	—27·5	—30·5	—34·0	0·5
26	23·5	7·5	—18·0	—32·0	14·5	— 7·5
27	19·5	17·5	—26·0	—32·0	— 7·0	—16·0
28	23·0	— 0·5	— 6·0	—26·5	— 5·0	—11·5
29	21·5	—11·0	— 9·0	—34·5	....	— 7·5
30	10·7	— 7·5	....	—37·5	....	0·0
31	9·0	....	....	6·5	....	16·0
Average	28·7	15·2	—11·3	—18·9	—19·3	— 4·3
Highest	41·0	36·0	20·0	10·0	28·0	34·0
Lowest	8·0	—16·0	—28·0	—39·0	—43·0	—37·0

YORK FACTORY, HUDSON BAY.

TABLE IX.—Mean Temperature for each Month, Quarter and Year from three series of Observation: (1st) September, 1842 to December, 1854, inclusive; (2nd) January, 1864, to April, 1868, inclusive; (3rd) January, 1876, to February, 1883, inclusive, with the Monthly, Quarterly and Annual Average for each period.

NOTE.—The observations in the two first groups were made at 8 a.m., 2 p.m. and 8 p.m., and in the latter at 7 a.m., 2 p.m. and 9 p.m.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Winter.	Spring.	Summer.	Autumn.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1842	....	....	....	....	....	....	....	....	43·75	28·53	9·12	— 3·77	....	....	....	27·13	....
1843	— 9·58	—21·67	— 9·00	17·64	26·33	42·12	55·76	56·57	40·80	20·05	9·56	— 3·93	—11·67	11·66	51·48	23·47	18·72
1844	—24·90	— 8·14	—10·61	22·06	28·41	39·28	54·68	49·98	41·34	26·92	3·06	— 8·10	—12·32	13·29	47·98	23·77	17·83
1845	—12·60	— 8·55	— 5·62	19·52	27·45	42·61	54·37	56·89	42·80	23·06	11·01	—13·30	— 9·75	13·78	51·29	25·62	19·81
1846	— 0·13	—17·28	6·29	11·72	34·56	57·18	59·80	55·20	39·99	25·01	14·76	— 5·97	—10·24	17·52	57·39	26·59	23·43
1847	—20·75	— 8·33	— 7·54	14·13	30·19	49·66	61·47	54·01	44·77	28·31	9·29	— 9·82	—11·68	12·26	55·05	27·46	20·45
1848	—19·61	— 4·96	— 4·47	22·34	30·01	42·84	55·57	50·41	38·79	28·33	9·54	—16·06	—11·47	15·96	49·61	25·55	19·39
1849	—16·19	—19·82	— 0·21	3·97	31·81	41·99	58·80	52·01	40·53	31·88	20·01	—17·82	—17·36	11·86	50·93	30·81	18·91
1850	—14·70	— 3·76	0·85	10·90	28·26	51·83	57·81	55·12	43·52	28·47	16·82	—13·13	—12·09	13·34	54·92	29·60	21·83
1851	—15·90	—16·02	2·50	17·00	29·44	43·94	55·56	49·98	45·40	30·65	11·60	— 8·79	—15·02	16·31	49·83	29·22	20·45
1852	—12·67	— 8·27	— 7·18	24·53	34·72	46·10	56·70	53·99	38·74	23·72	11·58	—17·25	— 9·91	17·36	52·26	24·68	20·93
1853	— 6·13	—18·63	— 0·83	14·41	29·49	42·47	60·79	55·39	42·76	31·09	— 5·69	—11·69	—14·00	14·36	52·88	22·72	19·45
1854	—27·17	—22·30	— 5·25	18·75	32·05	54·91	56·18	51·47	39·95	28·50	3·88	—17·29	—20·39	15·18	54·19	24·11	17·80
Average, 8 a.m., 2 p.m. and 8 p.m.	—15·03	—13·14	— 3·42	16·41	30·23	46·24	57·29	53·42	41·78	27·27	9·58	—11·30	—13·16	14·41	52·32	26·21	19·92
Average, 8 a.m. & 8 p.m.	—16·30	—15·30	— 6·32	13·90	28·11	44·03	54·94	51·29	39·89	25·76	8·52	—12·13	—14·58	11·90	50·09	24·72	18·03
1864	—12·92	— 8·02	—10·18	19·81	31·86	47·83	57·47	54·22	41·82	27·74	10·40	—18·57	....	15·83	53·17	26·65	20·12
1865	—14·12	— 4·98	3·16	11·99	29·55	44·54	55·40	52·94	43·93	29·89	17·99	—16·31	—12·56	14·90	50·93	30·60	20·98
1866	—10·89	—18·23	— 8·08	15·50	30·76	41·43	60·70	55·12	40·40	27·68	14·04	— 4·05	—15·14	12·73	52·42	27·37	19·35
1867	—12·86	—17·21	— 2·88	11·42	30·67	44·40	58·96	57·67	44·18	32·72	0·58	—16·69	—11·37	13·07	53·68	25·83	20·30
1868	—14·03	—18·93	3·82	3·73	....	....	....	....	....	....	....	....	—16·55	....	....	....	....
	—12·96	—13·47	— 2·83	12·49	30·71	44·55	58·13	54·99	42·58	29·51	10·75	—13·90	—13·44	13·46	52·56	27·60	21·72

1876	—16·40	—20·20	—11·70	21·00	38·30	49·10	56·60	55·60	46·00	26·60	1·40	—12·20	......	15·87	53·77	24·67	19·49
1877	—19·50	0·80	—10·90	21·80	43·00	43·96	61·22	54·27	44·59	29·85	15·02	— 4·62	—10·30	17·97	53·15	29·82	23·22
1878	— 6·92	2·78	10·24	26·66	33·11	64·89	73·80	58·81	37·50	21·91	17·78	— 6·50	— 2·92	23·34	65·83	25·73	27·8
1879	—23·56	—28·90	—11·85	19·37	34·67	57·55	59·22	51·02	43·80	29·27	6·04	—27·18	—19·65	14·06	55·93	26·37	17·48
1880	—23·84	—23·43	—10·73	10·83	31·94	51·37	58·53	49·00	38·50	24·99	1·72	—18·93	—24·82	10·68	52·97	21·74	16·3
1881	—27·72	—17·66	— 0·98	16·54	34·94	56·80	66·47	54·17	41·20	22·80	— 2·60	—12·04	—21·44	16·83	59·15	20·47	19·54
1882	—27·26	—13·20	— 9·47	18·85	35·09	51·78	68·24	54·51	44·81	37·70	12·89	—11·13	—17·50	14·82	58·18	31·80	21·90
1883	—25·34	—19·78	......	......	......	......	......	......	......	......	......	......	—18·75	......	......	......	......
	—20·74	—14·26	— 6·48	19·36	35·86	53·64	63·30	53·91	42·33	27·60	7·46	—12·23	—16·08	16·25	56·95	25·80	20·7

YORK FACTORY, HUDSON BAY.

TABLE X.—Mean Temperature of each Month and Year, from 1842 to 1854, at 8 a.m.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1842......	....	....	....	....	....	....	....	....	37·87	24·92	9·00	— 4·82	....
1843......	—12·69	—26·57	—16·05	10·27	22·21	37·03	50·69	50·15	36·43	17·69	7·17	— 6·76	14·13
1844......	—28·11	—11·43	—17·63	15·37	24·18	36·13	50·60	46·92	37·07	23·15	0·50	— 9·85	13·91
1845......	—14·73	—13·71	—12·60	14·43	23·98	40·03	50·15	51·02	39·90	20·11	9·57	—16·85	15·94
1846......	— 1·76	—22·18	1·37	9·07	33·40	54·67	56·69	50·92	35·63	22·44	14·20	— 7·66	20·57
1847......	—23·73	—11·79	—14·34	12·63	27·98	44·17	57·76	48·15	40·57	25·47	7·80	—11·24	16·95
1848......	—21·85	— 7·81	— 9·95	18·23	27·05	40·40	51·69	45·34	35·57	25·18	8·00	—17·60	16·19
1849......	—19·34	—24·89	— 6·56	2.05	29·60	39·57	56·85	47·73	37·13	30·34	19·67	—20·82	15·94
1850......	—17·27	— 7·14	— 5·53	9·67	26·40	50·90	57·18	55·44	40·33	27·05	15·67	—15·08	19·80
1851......	—19·79	—18·64	— 3·11	13·83	27·66	41·83	52·89	47·15	42·83	28·31	9·70	— 9·53	17·76
1852......	—14·63	—12·88	—12·89	22·63	33·53	44·95	55·18	51·89	36·73	22·15	10·90	—18·44	19·93
1853......	— 8·02	—23·75	— 5·60	10·87	27·15	41·53	59·40	54·63	0·83	27·95	—8·40	—13·47	16·93
1854......	—30·18	—26·54	—11·56	15·57	32·27	55·50	56·89	51·03	36·83	26·87	2·60	—18·44	15·90
Average	—17·67	—17·28	— 9·54	12·89	27·95	43·87	54·66	50·03	38·29	24·74	8·18	—13·12	17·00

TABLE XI.—Mean Temperature, 2 p.m.

1842......	....	....	....	....	....	....	....	....	49·00	31·27	10·07	— 3·37	....
1843......	— 7·56	—19·29	— 3·76	23·13	31·18	49·00	63·82	63·40	45·07	22·85	11·40	— 2·31	23·08
1844......	—22·53	— 4·74	— 4·50	29·03	33·27	44·03	59·37	53·92	45·37	30·98	5·30	— 6.66	21·90
1845......	—10·66	— 3·93	0·31	25·13	33·40	47·30	59·89	60·53	46·13	26·02	12·63	—10·89	23·82
1846......	1·76	—12·61	11·60	16·40	39·02	62·13	64·08	60·69	44·43	27·92	17·30	— 4·44	27·36
1847......	—18·53	— 2·39	— 1·50	17·80	34·73	55·73	66·37	60·18	49·07	31·85	11·57	— 7·92	24·75
1848......	—17·27	— 1·29	0·98	27·47	34·60	46·80	60·21	55·37	42·13	31·34	11·90	—14·34	23·16
1849......	—12·89	—15.29	6·18	8·84	36·60	46·57	62·76	56·18	43·93	34·79	21·73	—15·24	22·85
1850......	—11·18	0·53	7·60	14·10	31·69	55·10	61·05	57·15	46·70	30·76	19·60	—10·82	25·19
1851......	—12·79	—12·54	8·31	22·50	33·15	48·00	60·82	53·31	48·43	33·76	14·07	— 7·47	24·13
1852......	—10·05	— 3·29	— 2·53	29·40	38·19	49·67	61·18	58·57	41·90	26·47	13·43	—15·24	23·93
1853......	— 4·02	—13·64	4·66	20·13	33·60	45·50	64·47	59·21	45·93	34·95	—2·80	—10·50	23·12
1854......	—24·08	—17·46	1·11	23·37	34·18	58·23	59·85	53·63	44·03	30·90	5·77	—16·39	21·10
Average	—12·48	— 8·83	2·37	21·44	34·47	50·67	61·99	57·68	45·55	30·30	11·69	— 9·66	23·70

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Table XII.—Mean Temperature at 8 p.m.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1842......	....	....	....	....	....	....	....	....	44·37	29·40	8·20	— 3·11	....
1843......	— 8·50	—19·14	—7·18	19·53	25·60	40·33	52·76	56·15	40·90	19·60	10·10	— 2·73	18·95
1844......	—24·05	— 8·26	—9·69	21·77	27·79	37·67	54·08	49·11	41·57	26·63	3·37	— 7·79	17·68
1845	—12·40	— 8·00	—4·57	19·00	24·98	40·50	53·08	59·11	42·37	23·05	10·83	—12·15	19·65
1846......	— 0·40	—17·04	5·89	9·70	31·27	54·73	58·63	53·98	39·90	24·66	12·77	— 5·82	22·36
1847......	—19·98	—10·82	—6·79	11·97	27·85	49·07	60·27	53·69	44·67	27·60	8·50	—10·31	19·64
1848......	—19·79	— 5·78	—4·44	21·33	28·37	41·33	54·82	50·53	38·67	28·47	8·73	—16·24	18·83
1849......	—16·34	—19·29	—0·24	1·02	29·24	39·83	56·79	52·11	40·53	30·50	18·63	—17·40	17·95
1850......	—15·66	— 4·68	0·47	8·93	26·69	49·50	55·21	52·76	43·53	27·60	15·20	—13·50	20·50
1851......	—15·11	—16·89	2·31	14·67	27·50	42·00	52·98	49·44	44·93	29·89	11·03	— 9·37	19·45
1852......	—13·34	— 8·64	—6·11	21·57	32·43	43·67	53·73	51·50	37·60	22·53	10·40	—18·08	18·94
1853......	— 6·34	—18·50	—1·56	12·23	27·73	40·37	58·50	52·34	41·53	30·37	—5·87	—11·11	18·31
1854......	—27·24	—22·89	—5·31	17·30	29·69	51·30	51·79	49·76	38·98	27·74	3·28	—17·05	16·45
	—14·93	—13·33	—3·10	14·92	28·26	44·19	55·22	52·54	41·50	26·67	8·87	—11·13	19·06

Table XIII.—Average difference without regard to sign between the Mean Temperature of each Month and Year, and the monthly and annual averages of each group as given in Table.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1842 ...... 1854	5·7	6·1	3·7	4·5	2·0	4·8	2·0	2·2	1·9	2·7	4·4	4·2	1·25
1864 ...... 1868	0·9	5·4	4·3	4·1	0·6	1·6	1·7	1·4	1·5	1·8	5·3	4·9	0·57
1876 ...... 1883	4·2	8·1	4·5	3·3	2·8	5·5	5·2	2·2	2·8	4·0	6·7	5·6	3·28

YORK FACTORY, HUDSON BAY.

TABLE XIV.—Highest Temperature in each Month and Year from Observations made in the following groups of years.

(In the two first groups the entries are from the ordinary observation hours.)

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°		°	°	°	°	°	°	°	°
1842......	....	....	....	....	....	....	....	....	60·5	45·5	36·5	15 5	....
1843	23·5	8·5	17·5	46 5	53·5	77·5	80·5	85·5	68·5	44·5	27 5	28·5	85·5
1844......	2·5	31·5	13·5	53·5	57·5	73·5	76·5	67·5	57·5	60 5	33·5	15·5	76·5
1845......	18·5	29·5	33·5	46·5	77·5	77 5	77·5	88·5	63·5	47·5	37·5	13·5	88·5
1846	21·5	7·5	35·5	46·5	71·5	80 5	79·5	77·5	54·5	47·5	41·5	13·5	80·5
1847.....	11·5	13 5	22·5	42·5	57 5	79·5	90·5	73·5	66 5	48·5	31·5	15·5	90·5
1848......	16 5	29 5	33·5	48·5	58·5	74·5	84·5	73·5	60·5	54·5	29·5	14·5	84·5
1849......	13·5	3·5	34·5	44·5	71·5	69·5	87·5	73·5	63·5	54·5	40·5	18 5	87·5
1850......	24·5	31 5	36 5	45·5	53·5	76·5	80·5	77·5	78·5	51 5	41·5	13 5	80·5
1851.....	18·5	13·5	41·5	47 5	58·5	79·5	77·5	71·5	64·5	45·5	30·5	8.5	79·5
1852......	18·5	26 5	15·5	39·5	55·5	71·5	80·5	75·5	54·5	43·5	29·5	22·5	80·5
1853......	20·5	18·5	33.5	43·5	60·5	76·5	85·5	73·5	57·5	53 5	18·5	27·5	85·5
1854......	— 0·5	2·5	30·5	45·5	65·5	83·5	76·5	77·5	70·0	44·5	27·5	9·5	83·5
Mean.	15·8	18·0	29·0	45·8	61·7	76 7	81·4	76·3	63·1	49·4	32·7	16·7	83·6
1864......	26 5	29·5	14·5	45·5	46·5	80·5	86·5	74·5	64·5	37·5	34·5	14·5	86·5
1865......	13 5	20·5	44·5	52·5	69·5	78·5	86·5	87·5	63·5	52·5	36·5	10·5	87·5
1866......	30·5	12·5	29·5	47·5	61·5	84·5	94·5	82·5	60 5	61·5	34·5	22·5	94·5
1867......	17·5	22·5	50·5	44·5	54·5	74 5	84·5	78·5	74·5	38·5	35·5	10·5	84·5
1868......	4 5	14·5	48·5	34·5	....	....	....	....	....	....	....	....	....
Mean..	18·5	19·9	37·5	44·9	58·0	54·5	88 0	80·7	67·0	48·2	35·3	14·5	88·2
1875......	— 4 0	— 1·0	29·5	43·5	71·0	79·0	78·0	76·5	66·0	43·0	35·5	22·0	79·0
1876	22·0	17 0	24 0	54 0	78·0	79·0	99·0	86·0	74·0	42·0	35·0	24·0	99·0
1877......	20·0	44·0	36·0	54·0	82 0	91·0	104·0	82·0	83·0	57 0	38·0	32·0	104·0
1878......	26·5	40·0	36·0	53·5	75·0	100·5	106·0	91·5	60·2	38·2	35·0	29·0	106·0
1879.....	0·0	— 1·5	24·0	50·0	71·0	101·0	102·0	86·0	65·0	45·0	34·0	5·0	102·0
1880......	1·5	2 0	40·0	46·0	60·0	99·5	100·0	81·0	66·0	40·0	30·0	— 6·0	100·0
1881......	— 8·0	12 0	35·0	37·0	70·0	99·0	100·0	98·0	59·7	39 8	34·0	25·0	100·0
1882......	0·0	41·0	31·0	42·0	81·0	95·0	99·0	80·0	73·0	56·0	33·0	15 0	99·0
1883......	0·0	9·0	....	....	....	....	....	....	....	....	....	....	....
Mean.	6·4	18·1	31·9	47·5	73·5	93·0	98·5	85·1	68·4	45·1	34·3	18·3	98·6

YORK FACTORY, HUDSON BAY.

Table XV.—Lowest Temperature in each Month and Year from observations made in the following groups of years.

(In the two first groups the entries are from the ordinary observation hours.)

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1842	....	....	....	....	....	....	....	....	23·5	6·0	−21·5	−36·5	....
1843	−36·5	−41·5	−37·5	−13·5	−0·5	22·5	36·5	36·5	22·5	−6·5	−21·5	−37·5	−41·5
1844	−46·5	−36·5	−32·5	−11·5	4·5	26·5	30·5	38·5	28·5	−6·5	−32·5	−30·5	−46·5
1845	−39·5	−46·5	−40·5	−17·5	−1·5	25·5	38·5	38·5	30·5	5·5	−30·5	−36·5	−46·5
1846	−29·5	−39·5	−26·5	−18·5	12·5	28·5	41·5	37·5	28·5	4·5	−21·5	−36·5	−39·5
1847	−48·5	−33·5	−35·5	−11·5	16·5	27·5	38·5	33·5	32·5	−4·5	−33·5	−34·5	−48·5
1848	−19·5	−31·5	−33·5	−21·5	10·5	26·5	36·5	36·5	24·5	11·5	−29·5	−35·5	−35·5
1849	−33·5	−45·5	−29·5	−19·5	1·5	28·5	36·5	33·5	29·5	9·5	−24·5	−40·5	−45·5
1850	−38·5	−37·5	−38·5	−12·5	13·5	31·5	41·5	29·5	27·5	5·5	−14·5	−32·5	−38·5
1851	−38·5	−32·5	−26·5	−15·5	3·5	24·5	36·5	38·5	31·5	4·5	−18·5	−28·5	−38·5
1852	−31·5	−33·5	−29·5	−0·5	19·5	28·5	38·5	38·5	21·5	1·5	−13·5	−41·5	−41·5
1853	−37·5	−21·5	−31·5	−9·5	8·5	29·5	36·5	38·5	28·5	8·5	−32·5	−34·5	−37·5
1854	−47·5	−42·5	−32·5	−12·5	6·5	31·5	40·5	37·5	26·5	8·5	−33·5	−39·5	−47·5
Mean.	−37·3	−36·8	−32·8	−13·7	7·9	27·6	37·7	36·4	27·4	2·5	−27·3	−38·7	−42·25
1864	−36·5	−49·5	−30·5	−3·5	6·5	28·5	36·5	40·5	27·5	5·5	−16·5	−42·5	−49·5
1865	−42·5	−38·5	−31·5	−25·5	5·5	26·5	34·5	37·5	31·5	−0·5	−15·5	−37·5	−42·5
1866	−37·5	−41·5	−36·5	−11·5	16·5	25·5	34·5	38·5	27·5	−5·5	−18·5	−34·5	−41·5
1867	−39·5	−43·5	−41·5	−11·5	0·5	28·5	36·5	39·5	28·5	2·5	−38·5	−36·5	−43·5
1868	−37·5	−39·5	−28·5	−22·5	....	....	....	....	....	....	....	....	....
Mean.	−38·7	−42·5	−33·7	−14·9	7·3	27·2	35·5	39·0	28·8	0·5	−22·2	−37·8	−44·25
1875	−44·5	−41·0	−38·0	−22·5	9·0	30·0	40·0	40·0	28·0	8·0	−40·0	−40·5	−44·5
1876	−48·0	−53·0	−46·0	−16·5	−15·5	27·0	39·5	29·0	28·0	8·0	−25·5	−38·0	−53·0
1877	−45·0	−32·0	−36·0	−22·0	−8·5	26·0	38·0	31·5	24·0	10·0	−14·0	−28·5	−45·0
1878	−33·0	−27·0	−18·5	3·5	10·5	25·0	46·0	38·0	26·0	−2·0	−15·0	−28·0	−33·0
1879	−43·0	−48·0	−40·5	−21·0	19·5	32·0	43·0	36·0	31·0	0·0	−16·0	−28·0	−48·0
1880	−49·0	−48·0	−48·0	−21·0	4·0	26·0	37·0	36·0	27·0	2·0	−37·5	−50·5	−50·5
1881	−51·0	−38·0	−27·0	−11·0	4·0	27·0	38·0	33·0	28·0	1·0	−3[illegible]·0	−32·0	−51·0
1882	−49·0	−49·0	−31·0	−18·0	0·0	30·0	46·0	40·0	31·0	14·0	−18·0	−34·0	−49·0
1883	−52·0	−45·0	....	....	....	....	....	....	....	....	....	....	....
Mean.	−46·1	−42·3	−33·1	−16·1	2·9	27·9	40·9	35·4	30·4	5·1	−24·8	−34·9	−46·75

TABLE XVI.—Port Burwell

Months.	Observations.	Calms.	N. Number.	N. Average Velocity.	N.N.E. Number.	N.N.E. Average Velocity.	N.E. Number.	N.E. Average Velocity.	E N.E. Number.	E N.E. Average Velocity.	E. Number.	E. Average Velocity.	E.S.E. Number.	E.S.E. Average Velocity.	S.E. Number.	S.E. Average Velocity.
1885.																
October	186	18	7	13·	5	13·20	13	18·70	8	25·38	23	11·39	8	4 87	4	3·50
November..	180	41	4	7·25	3	1·66	22	11·36	12	27·42	6	25·66	—	—	3	4 33
December............	186	28	11	7·82	—	—	7	11·71	5	13·40	14	19·50	—	—	9	11·56
1886.																
January	186	22	15	31·	—	—	11	29·10	5	28·	19	29·	1	5·00	1	3·00
February	168	33	2	26·50	—	—	8	26·25	8	19·	28	33·25	1	40·	2	6·50
March	186	39	3	4·	—	—	30	10·10	18	9·17	16	21·62	—	—	—	—
April	180	27	11	17·18	—	—	15	33·93	9	38 66	19	24·16	—	—	2	3·50
May	186	28	5	14·40	1	3·	3	13·	7	15 57	44	24·90	2	20·	5	5·80
June.................	180	29	14	26·	—	—	4	35·75	9	35·55	19	34·53	—	—	3	5·66
July	186	33	3	20·	—	—	8	11·33	3	18·33	55	38·11	9	27·77	6	13·83
August	186	43	3	30·	1	50·	4	40·	9	42·22	19	22·58	2	9·	6	4·50
September.........	154	19	10	25·40	1	2·	6	4·33	1	4·	21	26·43	—	—	9	10·55
Year.........	2164	360	88	20·05	11	15 54	131	19·05	94	24·17	283	25·58	23	17·04	50	8·10

Station No. 1—Wind Table.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
4	12·75	6	10·17	2	1·00	22	17·34	10	9·90	16	12·31	12	13·58	23	10·61	5	13·20
3	2·66	—	—	—	—	2	10·	2	2·00	10	18·60	9	17·89	50	13·88	13	7·54
—	—	5	9·40	7	17·57	61	17·96	10	12·70	6	10·83	4	29·50	14	22·21	5	20·20
—	—	8	19·12	2	14·	56	30·73	14	40·85	13	24·39	6	13·66	13	16·	—	—
1	8·	7	9·71	6	8·50	46	24·82	13	40·39	4	25·50	4	21·50	4	27·25	1	50·00
1	5·	10	18·30	5	27·60	43	26·88	11	33 82	10	25·10	—	—	—	—	—	—
2	3·	1	6·	3	5·66	28	21·04	5	16·	22	23·70	11	20·	21	15·90	4	20·
—	—	6	4·33	1	5·	30	17·70	8	19·88	15	16·60	8	13·	21	17·48	2	18·
2	5·	18	4·28	4	6·50	36	7·60	15	7·26	15	17·73	6	18·50	5	19·60	1	30·
7	10·	11	3·64	5	7·	14	8·93	3	7·66	10	11·	1	5·	8	17·88	10	9·20
6	3·50	10	4·40	5	16·20	36	16·47	6	3·17	15	17·40	7	3·71	6	4·17	8	6·25
—	—	5	5·60	—	—	28	29·46	8	34·62	18	29·39	5	18·40	21	20·43	2	13·
26	6·88	87	8·43	40	12·65	402	21·02	105	24·45	154	18·40	73	16·00	186	16·	51	12·33

TABLE XVII.—Ashe Inlet—

Months.	Observations.	Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.
1885.																
September..	180	10	12	8·73	3	7·00	5	7·00	5	6·60	17	9·53	10	8·40	25	16·80
October	186	7	21	10·24	7	12·86	30	13·60	11	9·36	5	11·80	7	10·26	12	17·25
November...	180	6	35	15·03	15	12·06	50	10·78	13	9·77	21	13·50	2	16·50	8	22·00
December...	186	7	28	17·29	19	15·68	29	8·41	9	9·44	10	15·00	2	24·00	10	28·00
1886.																
January......	186	4	29	18·00	22	24·64	26	9·23	11	5·05	17	7·35	2	29·00	10	16·50
February ...	168	26	39	22·05	34	19·41	18	8·83	6	5·02	10	7·30	—	—	4	11·25
March	186	35	10	14·10	24	14·79	48	6·75	10	5·80	2	8·00	2	18·00	2	11·50
April	180	9	19	13·16	39	18·41	34	17·12	19	17·32	7	18·29	1	19·00	2	10·00
May	186	6	19	11·48	11	16·17	5	12·80	1	8·00	3	7·33	2	10·00	5	10·00
June...........	180	13	45	18·55	8	16·13	5	14·80	2	8·00	—	—	1	12·00	4	13·50
July	186	14	30	17·20	8	8·50	2	8·00	—	—	1	9·00	—	—	1	2·00
August	186	27	31	13·06	6	7·50	4	11·00	—	—	—	—	—	—	2	12·50
Year....	2190	164	318	16·05	196	12·58	256	10·63	87	10·04	93	11·05	29	13·17	85	17·14

Wind Table.

S.S E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.	No. Observations.	Average Velocity.
3	8·67	—	—	—	—	2	18·00	1	42·00	3	30 67	8	20·75	60	23·27	16	13 88
18	21·56	25	16·04	5	13·20	4	17·50	4	20·25	7	13 00	2	20·00	13	14·92	8	11·37
8	17·77	7	20·30	—	—	—	—	—	—	—	—	—	—	5	24·20	10	30·30
30	22·27	25	26·44	1	16·00	1	7·00	—	—	1	5·00	—	—	6	18·00	8	19·50
15	25·26	9	19·22	8	10·00	1	12·00	3	4·67	—	—	2	17·50	14	15 21	13	17 31
13	20·30	2	8·50	9	19·00	2	6·00	—	—	1	18·00	1	19·00	1	23·00	2	24·50
4	9·75	9	21·44	23	23 30	2	14 50	1	8·00	3	8·00	5	10·40	1	12 00	5	19·60
3	9 67	4	16·50	12	12·42	20	26·15	5	17·80	—	—	—	—	1	1·00	5	15·20
14	13·79	64	21·86	26	18·85	6	12·67	—	—	1	4·00	3	7·67	10	12·20	10	15·20
13	17·77	31	12·81	3	4·33	—	—	1	6·00	4	6·00	3	8·00	14	18·64	33	16 21
4	10·50	94	19·88	4	6·75	1	5·00	2	5·00	3	4·00	2	9·50	1	4·00	19	21·00
34	19·32	27	12·92	4	7·25	6	3·83	—	—	2	1·50	2	12·00	15	10·33	26	15·43
159	19·18	297	19·79	95	16·62	45	18 51	17	15·27	25	10·76	28	13·64	141	10·00	155	17·59

TABLE XVIII.—Stupart's Bay, Station No. 4—

Months.	Observations.	Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
1885.																
September..	180	9	27	11·2	1	6·0	18	7·5	4	6·0	20	13·6	5	11·2	13	10·5
October	186	8	17	16·0	3	11·3	4	4·3	—	—	7	10·4	2	2·0	16	11·6
November...	180	3	9	10·7	3	5·7	1	3·0	5	12·0	14	17·3	7	2·1	1	18·0
December...	186	20	—	—	1	12·0	1	31·0	—	—	7	15·9	6	22·2	6	16·8
1886.																
January.....	186	30	2	12·5	—	—	1	6·0	2	10·0	9	11·2	4	11·0	—	—
February ...	168	13	—	—	4	8·5	2	10·5	2	12·0	6	7·5	4	15·5	2	7·5
March	186	63	5	7·6	—	—	2	13·0	—	—	2	2·5	—	—	5	17·0
April	180	15	5	11·0	1	10·0	2	3·5	2	17·5	2	2·0	10	11·9	1	4·0
May	186	24	13	11·9	4	8·5	3	8·3	4	7·5	9	9·9	21	15·7	17	12·2
June	180	38	15	11·3	5	10·2	3	10·7	2	12·5	14	5·9	3	2·3	1	9·0
July..	186	75	14	9·7	7	7·3	3	6·0	6	1·8	21	3·3	13	2·3	1	1·0
August	186	40	15	8·7	7	6·9	2	9·0	6	6·3	8	2·8	10	3·3	4	2·5
Year	2190	338	122	11·3	36	9·6	42	8·0	33	8·1	119	9·4	85	10·1	67	11·5
September (15 days)	90	5	4	110·6	4	6·2	—	—	—	—	7	19·4	10	12·2	4	10·8

1st September, 1885, to 15th September, 1886.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W N.W.		N.W.		N.N.W.	
Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
5	7·4	3	48·0	—	—	1	4·0	2	17·0	3	29·0	17	27·6	33	16·4	19	15·5
10	17·3	3	8·7	3	11·0	7	12·6	8	8·1	22	8·1	24	9·4	30	13·5	22	14·5
—	—	—	—	—	—	1	20·0	5	5·0	26	12·5	34	10·6	32	11·6	39	17·4
4	21·8	8	14·4	5	11·6	6	8·3	11	8·9	21	11·7	31	10·1	35	13·9	24	22·4
—	—	2	15·0	—	—	11	10·0	16	14·8	35	19·6	25	7·2	27	17·7	22	20·5
—	—	—	—	1	11·0	2	1·0	16	14·9	25	7·8	29	6·7	30	16·4	32	23·4
5	7·8	3	4·4	4	11·0	7	10·4	7	19·4	11	9·3	13	5·2	32	24·0	27	13·9
5	2·4	4	7·7	5	4·2	7	5·1	3	4·7	11	8·1	9	6·3	38	14·3	60	21·8
7	6·3	3	3·4	2	11·5	3	8·7	12	15·8	13	11·8	9	4·4	21	10·6	21	12·7
1	1·0	1	1·0	4	6·5	—	—	4	8·0	8	12·0	8	11·5	44	21·3	29	18·3
4	1·3	—	—	—	—	3	8·7	2	18·0	6	13·7	7	8·0	11	14·5	13	13·7
2	5·0	3	3·0	5	3·0	5	6·2	14	17·8	13	11·1	1	8·0	36	19·1	15	15·1
43	9·7	30	8·2	29	8·0	53	8·8	100	13·5	194	12·3	207	10·0	369	16·5	323	18·6
—	—	4	3·2	2	5·5	2	5·5	4	10·5	12	23·0	15	16·1	11	12·4	6	10·5

TABLE XIX.—W nd Table, Station No. 5

Months.	Observations.	Calms.	N.		N.N.E.		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
1885.																
September..	180	5	15	10·66	31	14·87	34	11·41	3	8·66	7	10·86	4	12·25	7	14·86
October.....	186	11	23	9·26	3	9·66	18	7·22	...	....	19	9·47	5	14·40	17	10·57
November..	180	2	13	8.77	5	3·00	22	10·19	7	10·57	31	9·61	4	9·00	13	16·38
December...	186	44	5	22·80	6	23·83	18	17·56	3	18 00	11	24·27	1	15·00	5	16·00
1886.																
January.....	186	49	6	14·66	—	—	3	5·33	3	26·33	10	10·20	1	7·00	1	13·00
February ...	168	47	14	11·71	2	11·00	12	16·33	2	25·50	3	12·33	......	....	.....	....
March.......	186	11	24	18·75	8	4·88	25	10 48	1	3·00	2	5·00	2	8·50	6	11·00
April.........	180	8	26	16·69	2	15·50	10	14·60	4	16·75	9	11·89	1	20·00	2	8·00
May...........	186	9	31	21·48	4	11·00	21	11·76	3	19·67	17	16·89	6	14·33	6	15·67
June	180	29	30	14·90	4	16·75	23	10·35	1	4·00	10	4·70	4	4·25	12	3·50
July..........	186	13	5	8·80	8	10·12	66	11·52	4	6·00	12	5·25	2	6·00	2	2·50
August......	186	24	8	10·88	6	11·00	38	11·29	10	5·50	9	8·33	6	4·50	15	6·53
Year......	2190	252	200	14·86	79	12·63	290	11·56	41	12·10	140	11·06	36	9·94	86	10·58

—1st September, 1885, to 1st September, 1886.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
3	14·00	9	13·33	6	9·33	5	5·60	......	....	30	24·16	4	11·75	12	10·40	5	7·20
1	5·00	12	9·42	1	10·00	13	12·61	2	16·00	38	8·79	8	5·50	12	5·42	3	6·67
2	9·00	2	5·00	......	....	22	18·73	5	17·20	33	14·24	2	2·00	13	13·00	4	6·50
1	12·00	14	22·43	4	18·00	24	13·33	10	12·40	36	9.67	......	....	3	5·00	1	3·00
1	18·00	14	16·43	10	18·20	36	18·61	15	23·80	33	11·91	1	6·00	3	25·00	......	....
...	....	2	21·00	1	10·00	23	17·43	11	10·18	40	8·77	3	5·67	7	6·43	1	12·00
3	22·33	2	21·00	6	18·33	37	16·16	9	16·89	33	6·85	9	6·00	6	9·00	2	13·00
...	....	2	14·50	3	12·00	20	15·05	13	11·15	52	9·25	9	6·22	18	7·61	1	14·00
1	19·00	14	13·00	5	12·40	32	17·00	8	13·12	18	10·39	3	5·00	5	13·80	3	11·33
...	....	4	10·00	5	14·50	20	11·65	9	13·00	19	13·47	3	21·00	7	9·14	......	....
2	6·00	6	9·83	7	10·86	31	16·29	4	16·75	15	10·87	2	16·50	6	15·83	1	13·00
3	6·00	5	7·00	4	15·00	29	15·89	6	12·17	19	14·47	2	13·50	1	5·00	1	10·00
17	12·41	86	14·14	52	14·36	292	13·59	92	11·01	366	10·42	46	7·82	93	9·06	22	8·23

TABLE XX.—Wind Table, Digge's Island, Station No. 6

Months.	Observations.	Calms.	N.		N.N.E		N.E.		E.N.E.		E.		E.S.E.		S.E.	
			Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
1885.																
September..	180	5	15	13·11	7	11·71	22	17·81	31	21·08	9	14·55	6	15·33	7	12·28
October.....	186	8	13	10·84	7	10·57	14	13·92	1	5·00	9	14·00	11	14·81	23	16·21
November..	180	9	7	17·57	7	6·57	17	20·35	12	28·58	10	11·50	9	9·11	33	20·37
December..	186	12	3	35·33	5	25·80	11	33·90	8	34·50	1	25·00	7	20·71	27	21·59
1886.																
January.....	186	9	3	24·66	...	....	7	17·14	4	17·77	5	13·60	2	28·00	28	10·39
February...	168	14	15	11·73	2	15·00	12	16·75	9	30·88	1	5·00	2	22·00	27	9·62
March........	186	13	13	29·07	7	19·57	14	25·92	16	19·06	7	12·00	6	11·83	11	19·27
April	180	7	21	12·85	9	15·77	15	19·20	8	13·00	6	24·33	3	16·66	9	20·33
May..	186	4	10	15·40	7	17·00	13	22·92	12	23·75	3	16·66	4	16·75	12	32·41
June	180	20	23	11·95	12	13·66	16	16·00	16	15·81	3	6·66	.....	....	6	7·00
July	186	15	6	9·83	4	8·50	25	20·52	15	18·53	3	7·66	10	13·20	20	8·00
August......	186	17	3	4·00	9	14·44	16	25·68	17	18·94	9	18·44	2	7·50	3	5·33
Year.......	2190	133	132	14·88	76	14·30	182	20·63	149	21·47	66	14·53	62	14·79	206	11·08

—1st September, 1885, to 31st August, 1886.

S.S.E.		S.		S.S.W.		S.W.		W.S.W.		W.		W.N.W.		N.W.		N.N.W.	
Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.	Number.	Average Velocity.
5	21·60	7	24·14	2	24·50	9	14·22	3	16·33	7	26·71	11	21·45	16	19·81	18	14·72
15	21·40	12	13·75	10	13·60	13	20·46	5	7·00	1	10·00	18	12·38	20	9·65	6	5·66
9	14·88	7	16·28	6	13·00	12	20·50	6	18·00	7	17·28	3	12·66	17	14·41	9	21.44
26	25·26	20	11·75	16	15·62	7	16·28	9	17·22	13	13·76	5	15·80	7	17·14	9	15·66
36	15·52	33	17·06	25	17·96	16	21·18	4	24·00	7	8·57	1	9·00	4	34·25	3	21·66
30	13·46	13	13·84	10	23·00	3	27·00	...	....	5	17·40	6	10·50	8	14·12	11	14·18
49	15·28	21	14·38	7	20·15	9	11·33	...	....	.....	....	......	....	5	7·20	7	14·14
13	15·38	14	14·07	4	19·25	3	14·00	3	9·33	15	12·00	14	11·14	10	15·20	26	11·57
18	22·44	15	17·73	14	18·21	17	15·82	6	10·83	15	11·73	4	15·00	16	13·37	16	25·31
17	7·11	16	7·75	2	14·00	7	8·71	2	7·50	12	11·58	3	5·33	8	11·62	17	9·52
28	8·53	22	11·13	3	6·00	2	4·00	4	10·00	1	11·00	5	11·80	15	8·66	8	10·37
18	10·50	37	11·48	16	17·50	1	7·00	3	7·00	14	7·85	6	11·83	5	5·00	10	8·20
264	15·46	217	13·75	115	17·31	99	16·79	45	13·60	97	12·98	96	13·14	131	13·54	140	14·16

TABLE XXI.—Showing the number of days in each month, at each Station where the Velocity of the Wind equalled a Gale (30 miles an hour and upwards.)

Months.	Belle Isle.	Port Burwell.	Ashe Inlet.	Stupart's Bay.	Nottingham Island.	Digges Island.
1885.						
September	....	....	....	8	5	9
October	16	8	5	4	0	6
November	18	7	9	3	5	6
December	22	12	12	8	4	13
1886.						
January	17	23	10	8	3	5
February	19	17	9	8	3	5
March	21	16	4	6	4	7
April	17	19	7	5	4	6
May	5	14	10	0	4	2
June	7	12	9	3	0	2
July	6	13	8	4	0	4
August	17	10	5	4	0	5
September	4	17	8	....	....	....
Year	169	168	96	61	32	70

TABLE XXII.—Showing the number of hours of Fog observed at the Stations named.

Months.	Belle Isle.	Port Burwell.	Ashe Inlet.	Stupart's Bay.	Nottingham Island.	Digges Island.	Churchill.
1885.							
October	152	8	64	13	12	12	48
November	88	0	0	0	0	28	96
December	32	0	0	10	0	0	72
1886.							
January	168	0	0	60	0	0	48
February	144	0	0	43	0	0	0
March	312	0	12	74	0	8	0
April	24	28	4	35	4	16	42
May	216	24	44	59	12	76	—
June	248	204	60	68	20	124	44
July	368	44	92	147	56	188	8
August	104	196	88	40	80	208	*16
September	136	26	—	—	—	—	—
Year	1,992	530	....	....	....	....	....

*1st to 14th only.

TABLE XXIII.—Showing the number of hours Snow at the several Stations named.

Months.	Belle Isle.	Port Burwell.	Ashe Inlet.	Stupart's Bay.	Nottingham Island.	Digges Island.
1885.						
September	0	41	13	86	55	58
October	71	60	48	110	81	77
November	35	34	39	105	87	40
December	49	58	86	144	203	57
1886.						
January	98	8	48	95	78	5
February	136	36	40	113	71	19
March	208	31	8	76	56	95
April	104	3	30	139	49	94
May	25	10	52	86	114	132
June	0	15	20	45	15	0
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September	40	34	—	—	—	—
Year	766	296	384	999	809	577

TABLE XXIV.—Meteorological Observations, H.M.S. Fury—Capt. Sir Ed. Parry, R.N.

—	Temperature.				Position.
	Max.	Min.	Mean.	Sea W	
1821.					
June	53·5	30·	40·45	39·36	England to Hudson's Straits.
July	50·	29·	35·38	31·82	Hudson's Straits.
August	48·	28·	36·60	32·22	Upper Hudson's Straits to Vanseltart Isle.
September	42·	20·	31·06	31·99	Vanseltart Isle to Lyon Inlet.
October	32·5	—13·	12·51	......	Winter Harbour.
November	28·	—20·	7·75	....	do
December	2·	—29·	—12·94	....	do
1822.					
January	— 6·	—37·5	—22·96	....	do
February	— 4·	—37·	—24·97	....	do
March	13·	—35·	—11·64	....	do
April	29·	—12·	5·51	....	do
May	46·	— 5·	23·09	....	do
June	50·	20·	33·97	....	do
July	54·	30·	36·34	....	Winter Island to Straits Fury and Hecla.
August	50·	27·	33·68	....	Straits of Fury and Hecla.
September	37·	11·	24·45	....	Straits of Fury and Hecla to Igloolick.
October	29·	— 9·	12 79	....	Igloolick.
November	8·	—32·	—19·37	....	do
December	—10·	—43·	—27·80	....	do
1823.					
January	+22·	—45·	—17·07	....	do
February	21·	—43·	—20·41	....	do
March	4·	—41·	—19 75	....	do
April	32·	—25·	— 1·68	....	do
May	49·5	— 8·	24·85	....	do
June	52·	8·	32·16	....	do
July	59·	30·	40·04	....	do
August	55·	24·	37·77	....	do to Winter Island.
September	51·	23·	33·76	....	Lyon Inlet to Cape Farewell.
October	....	....	....	....	

TABLE XXV.—Weekly Abstract of Observations taken on board Dominion Steamer "Alert"—June to October, 1886.

Weeks ending	Barometer.				Temperature.				Hours Rain.	Hours Snow.	Hours Fog.	Observations Wind, 30 miles and over.
	Mean.	Highest.	Lowest.	Range.	Mean.	Max.	Min.	Range				
1886.												
July 1	29·793	30·160	29·492	·668	48·84	57·2	38·5	18·7	22	......	56	4
do 8	·756	·070	·509	·561	36·63	48·0	33·0	15·0	26	16	38	5
do 15	·787	29·984	·420	·564	38·42	48·8	32·5	16·3	18	......	28	......
do 22	·664	·912	·390	·522	38·63	42·5	32·0	10·5	12	......	22	1
do 29	·727	·953	·502	·451	40·71	53·0	36·0	17·0	36	......	38	......
Aug. 5	·924	30·192	·702	·490	49·42	84·0	39·0	45·0	14	......	40	6
do 12	·824	29·978	·606	·372	53·68	71·0	44·0	27·0	20	......	2	......
do 19	·807	30·101	·355	·746	55·90	76·0	43·0	33·0	8	......	12	......
do 26	·727	·101	·141	·960	46·94	61·0	39·0	25·0	14	......	32	6
Sept. 2	·742	29·998	28·873	1·125	39·62	52·0	35·5	16·5	64	......	38	9
do 9	·851	30·134	29·234	·900	36·92	44·0	32·0	12·0	30	10	10	13
do 16	·578	·055	·120	·935	35·36	42·3	32·0	10·3	14	6	10	20
do 23	·642	·074	28·857	1·217	46·23	43·2	27·6	15·6	12	2	18	23
do 30	·935	·233	29·403	·830	34·49	45·0	28·5	16·5	8	2	......	7
Oct. 7	·676	·275	·017	1·258	39·95	50·0	32·0	18·0	22	2	4	2
Voyage	29·762	30·275	28·857	1·418	42·776	84·0	27·6	56·4	320	38	348	96

Table XXVI.—Temperature of the Sea.

Date. — Months.	Position of Ship. Lat. N.	Long. W.	Sea Temperature.	Date. — Months.	Position of Ship. Lat. N.	Long. W.	Sea Temperature.
	° ′	° ′			° ′	° ′	
June 25...	44 54	61 20	54·02	Aug. 18...	....	....	56 52
do 26...	46 05	59 18	51·86	do 19...	....	....	54 29
do 27...	47 49	59 46	50.52	do 20...	....	....	50 63
do 28...	49 23	59 05	48·83	do 21...	....	....	43·74
do 29...	51 30	56 42	44·87	do 22...	....	....	42·33
do 30...	53 22	55 22	39·53	do 23...	....	....	41·82
do 31...	....	....	....	do 24...	62 37	89 36	44·35
July 1...	56 59	59 49	37·93	do 25...	61 18	88 09	42·11
do 2...	56 59	59 49	34·13	do 26...	61 16	82 25	41 33
do 3...	57 52	61 17	35·53	do 27...	60 58	85 18	40·08
do 4...	....	....	34·76	do 28...	62 06	83 44	40·31
do 5...	60 46	63 02	32·30	do 29...	62 43	57 52	39 18
do 6...	60 58	64 08	32·53	do 30...	Port Laperrière........		37·46
do 7...	60 20	64 00	31·16	do 31...	....	....	37 83
do 8...	60 02	63 33	31 23	Sept. 1...	....	....	38 15
do 9...	61 03	64 41	32 76	do 2...	....	....	36 69
do 10...	61 27	67 38	35·58	do 3...	....	....	36 14
do 11...	62 22	71 16	36 06	do 4...	....	....	37 96
do 12...	62 52	73 09	33·52	do 5...	....	....	35·63
do 13...	63 04	74 03	32·35	do 6...	....	....	33 88
do 14...	62 56	75 12	32·48	do 7...	Left port........		34·93
do 15...	63 00	76 46	31·21	do 8...	Port DeBoucherville........		32·46
do 16...	63 00	77 01	30 76	do 9...	62 59	75 05	32·83
do 17...	62 58	77 14	31 23	do 10...	62 54	32 32	33 00
do 18...	63 04	77 05	31·46	do 11...	....	....	33 02
do 19...	62 48	77 29	30·43	do 12...	Ashe Inlet........		33·72
do 20...	Port Laperrière........		30 32	do 13...	....	....	32·58
do 21...	....	....	31·10	do 14...	....	....	32·78
do 22...	....	....	31 48	do 15...	....	....	33 18
do 23...	....	....	32 08	do 16...	Running across Straits........		33 93
do 24...	....	....	33·46	do 17...	Stupart's Bay........		34·42
do 25...	62 39	78 53	30·82	do 18...	....	....	34·57
do 26...	62 47	78 58	33·93	do 19...	....	....	34 05
do 27...	61 45	82 06	34 60	do 20...	....	....	33 58
do 28...	....	....	36·21	do 21...	....	....	34·04
do 29...	Fort Churchill........		43 12	do 22...	....	....	33 57
do 30...	....	....	50·31	do 23...	....	....	32·94
do 31...	....	....	48·43	do 24...	....	....	32·24
Aug. 1...	....	....	50·17	do 25...	Left the Bay........		32·49
do 2...	....	....	51·42	do 26...	60 39	65 39	32·69
do 3...	....	....	55·75	do 27...	Port Burwell........		32·90
do 4...	....	....	49·73	do 28...	....	....	33·41
do 5...	58 05	91 30	38·75	do 29...	Left anchorage........		33·92
do 6...	57 11	... ..	48·67	do 30...	Skynner's Cove........		35 67
do 7...	57 11	92 14	48 03	do 31...	....	....	....
do 8...	57 11	92 16	49·04	Oct. 1...	Left Skynner's Cove........		34·69
do 9...	....	....	49·66	do 2...	58 50	59 51	34 98
do 10...	....	....	50·63	do 3...	56 13	57 10	36·69
do 11...	....	....	50·36	do 4...	53 50	55 18	37·50
do 12...	....	....	48·62	do 5...	51 44	56 15	40·12
do 13...	....	....	46 96	do 6...	Forteau Bay........		43 18
do 14...	57 12	... ...	48 18	do 7...	49 41	58 43	44·33
do 15...	58 50	92 30	42·83	do 8...	Off Meat Cove........		49·31
do 16...	Churchill........		50·40	do 9...	Port Hawkesbury........		53·58
do 17...	....	....	55·21	do 10...	Halifax........		54 33

APPENDIX "A" TO HUDSON BAY REPORT.

RESULTS OF TIDAL OBSERVATIONS AT THE STATIONS.

The tidal observations taken at the stations in Hudson Straits, were examined carefully, and periods of fifteen or thirty days selected, in which there were the fewest lacunae. These observations were plotted on profile paper, and curves drawn representing the tidal wave. The hourly readings were taken from the curve and reduced to barometer 28 inches, by adding a correction at the rate of one foot of height of tide to one inch of barometer.

The readings so reduced were abstracted in groups according to the system recommended by Professor Darwin, in his article on tides. The hourly means of these groups were then harmonically analysed, and the tidal constants reduced.

At the two stations in the centre of the Straits, Ashe Inlet and Stupart's Bay, the periods selected were the months of April and May respectively, during which time the Straits were completely covered with ice. At all other stations the periods selected were in the open season.

The following table gives the tidal constants, with the exception of A_o, which, as it only represents the height of mean tide on the gauge, is not necessary for tidal prediction.

M_2, is the principal lunar tide (semi-diurnal).
H_m, the mean semi-range of this tide.
$\varkappa_m$, the angle of retardat on, called by Darwin *the lag.*
S_2, the principal solar tide (semi-diurnal).
H_s, the mean semi-range of this tide.
$\varkappa_s$, the retardation angle or lag.
K_2, the luni-solar, semi diurnal tide.
H^{II}, the mean semi-range.
K^{II}, the retardation angle or lag.
$\varkappa_I$, luni-solar diurnal tide.
H^I, mean semi-range.
$\varkappa^I$, retardation angle or lag.
P, solar diurnal tide.
H_p, mean semi-range.
$\varkappa_p$, retardation angle or lag.
O, lunar diurnal tide.
H_o, mean semi-range.
$\varkappa_o$, retardation angle or lag.

TIDAL CONSTANTS for Hudson Straits Stations.

—		Port Burwell.	Ashe Inlet.*	Stupart's Bay.*	Nottingham Island	Port Laperrière.
Latitude		60° 24′ 45′·2 N.	62° 33′ N.	61° 35′ N.	63° 12′ N.	62° 34′ N.
Longitude		64° 46′ 00′ W.	70° 35′ W.	71° 32′ W.	77° 28′ W.	78° 1′ W.
M_2	H_m	7.122 ft.	10·995 ft.	9 022 ft.	4 736 ft.	3·09 ft
	κ_m	262° 55′ 6	233° 52′·7	226° 58′·5	259° 34′	257° 25′
S_2	H_s	2·329 ft.	3·978 ft.	3 049 ft.	1·771 ft.	1·24 ft.
	κ_s	304° 43′·2	296° 23′·7	288° 59′·2	320° 30′	315° 58′
K_2	H''	0 635 ft.	1·084 ft.	0 831 ft.	0 483 ft.	0·34 ft
	κ''	304° 43′·2	296° 23′·7	288° 59′·2	320° 30′	315° 58′
K_1	H'	0·476 ft.	0·516 ft.	0 468 ft.	0·218 ft.	0·14 ft.
	κ'	113° 49′·6	107° 41′ 4	102° 38′ 3	91° 24′	64° 20′
P	H_p	0 159 ft.	0·172 ft.	0·156 ft.	0·073 ft.	0 05 ft.
	κ_p	113° 49′ 6	107° 41′·4	102° 38′·3	91° 24′	64° 20′
O	H_o	0·190 ft	0·213 ft.	0·307 ft.	0·253 ft.	0·04 ft.
	κ_o	157° 21′·8	348° 48′	6° 2′ 6	16° 42′	126 00′

* Winter tides, Straits covered with ice.

Putting the above table in the form now generally used for the ordinary purposes of navigation, the results become:—

Port Burwell.

	H. M.
Time of H. W. F. and C	9 25
Mean luni-tidal interval	9 04
	Feet.
Mean rise and fall	14·24
do springs	18·90
do neaps	9·59

Ashe Inlet.

	H. M.
Time of H. W. F. and C	8 32
Mean luni-tidal interval	8 04
	Feet.
Mean rise and fall	22·00
do springs	29·95
do neaps	14·03

Stupart's Bay.

	H. M.
Time of H. W. F. and C	8 11
Mean luni-tidal interval	7 50
	Feet.
Mean rise and fall	18·04
do springs	24·14
do neaps	11·94

Port Deboucherville, Nottingham Island.

	H. M.
Time of H. W. F. and C	9 30
Mean luni-tidal interval	8 57
	Feet.
Mean rise and fall	9 47
do springs	13·01
do neaps	5·93

Port Laperrière, Digges Island.

	H. M.
Time of H. W. F. and C	......
Mean luni-tidal interval	8 53
	Feet.
Mean rise and fall	6·18
do springs	8·66
do neaps	3·70

Nachvak Bay, Skynner's Cove.

From observations of times and height of high and low water.

	H. M.
Time of H. W. F. and C	7 08
Mean luni-tidal interval	7 01
	D. H. M.
Age, from graphic method	1 12 42
	Feet.
Mean rise and fall	3·69
do springs	4·88
do neaps	2·58

NOTE.—No correction for barometric changes was applied to these observations

Port Churchill.

	H. M.
Time of H. W. F. and C.	7 06
Mean luni-tidal interval	6 44
	Feet.
Mean rise and fall	11·7
do springs	15·5
do neaps	8·0

Marble Island.

Approximate results from two days' observations.

	H. M.
Time of H. W. F. and C.	4 10
Mean luni-tidal interval	3 54
	Feet.
Mean rise and fall	9·00
do springs	12·00
do neaps	6·00

ANDREW R. GORDON.

APPENDIX

COPY of Table of Experiments for ascertaining the Depth of Frost and Thaw pene

Height above sea

No.	Year.	Date.	Description of Locality.	Wet or Dry.	Depth of Snow.
					Inch's
1 to 7	1879-86	Jan., Feb and Mar..	Depth of ice in channel of River Hayes......	....	....
8 to 10	1879	Aug. 25...	200 yds. W., 300 yds. N. W., and 300 S. of York; swamp.	....	....
11 to 13	1880	do 10...	100 yds S, 100 S. W., and 300 S of York; swamp...	....	....
14	1881	July 23...	400 yds. N. of York, grave, alluvial 20 inches, white clay, dense blue clay.	Dry	....
15 to 20	1882	Sept. 10...	500 yds. N. of York, old Indian burial ground, 6 graves opened, alluvial 4 feet, sandy clay.	do	....
21 to 485	1882-83	Dec., Jan. and Feb	Nelson River (mouth of and 30 miles up) 7 miles from York, due North; 485 cross soundings taken by surveyors to ascertain channel of river; white clay, sand, blue clay.	....	....
486	1883	Sept. 10...	River Hayes, bank exposed to full intensity of frost...	Dry	....
487	1884	July 15...	Land slip, River Hayes	....	....
488-491	1884	Aug. 30...	600 yds. N. of York, 4 graves opened, alluvial 40 inches, sandy clay.	....	....
492	1885	April 14...	400 yds. N. of York, grave, alluvial 22 inches, white clay, blue clay.	Very dry....	15
493	1885	June 18...	Land slip, River Hayes	....	....
494	1886	April 28...	N. of York, open ground, mossy grass.........	Dry	....
495	1886	May 4...	400 yds. N. of York, grave, alluvial 21 inches, &c.....	Wet.........	20
496	1886	do 28...	York, garden soil.........	Wet and dry.	....
497	1886	do 28...	400 yds. N of York, grave, alluvial 21 inches, &c....	Wet.........	....
498	1886	do 31...	1,000 yds. S. of York, swamp	do	....
499	1886	June 4...	York, grave, alluvial 23 inches, &c.........	Dry	....
500	1886	do 4...	Swamp around York	....	....
501	1886	do 14...	Bank of River Hayes, land slip, white clay and mud.	....	....
502	1886	do 14...	Shore of River Hayes, sand and mud	....	....
503	1886	do 14...	York, garden soil	Wet and dry.	....
504	1886	do 23..	Grave, alluvial 2 inches, &c	....	....
505	1886	do 25...	450 N. of York, new lime kiln, sandy clay, 20 feet....	Very dry	....
506	1886	do 26...	†A clearing	Swampy	....
507	1886	Aug. 30...	Severn, H.B. post, 300 miles S.W of York; cutting for jetty (40 feet in length and 15 feet in depth) shelving backwards and upwards to surface.	Dry	....
508	1886	July 1...	Within 20 yds. of experiment, 506	Now dry	....
509	1886	do 1...	Swamp around York.	Wet.........	....
510	1886	do 3...	do (two days' rain).........	do	....
511	1886	do 7...	Within clearing, experiment 506, fine weather	Dry	....
512	1886	Aug. 2...	Swamp around York.........	Wet.........	....
513	1886	do 2...	Open ground around York..	Dry	....

†The above clearing is the most bare and bleak in the neighborhood of York; it is nearly at all so that its soil is fully exposed to the greatest degree of frost penetration possible, not only from above a trench dug (10 feet in length) down to the non-frozen sub-soil with the result detailed in No. 506. depth of frost penetration in and around York, and may certainly be ranked as perpetual ice, but upon ground, I may mention that I had an Indian working hard for three days to obtain this information.

NOTE.—The varying nature of the instrument sometimes employed (skull and screw augers of of the measurements in the foregoing experiments.

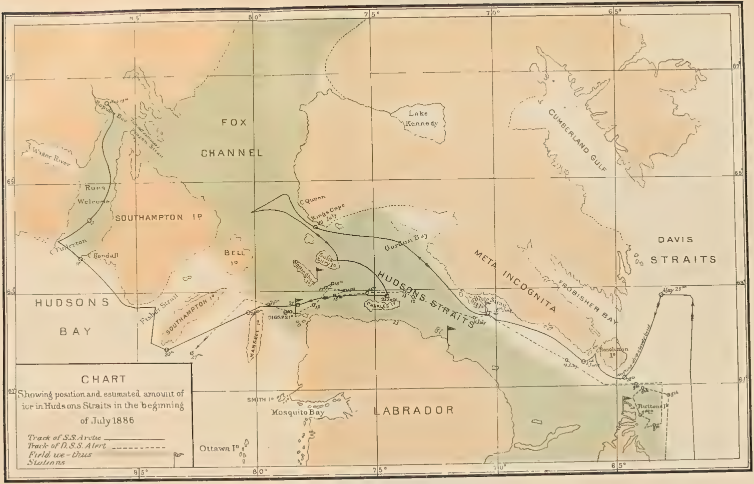
B.

tration, York Factory, Hudson's Bay, Latitude 57° N., Longtitude 92° 26' W
level, 51 feet.

Frost Penetration.	Superficial Thaw.	Total Depth of Boring.	Rain and Snowfall for mean of year.		Thermometrical readings for mean of year.	Explanatory Remarks.
		Feet.	Rain.	Snow.		
Avg. 6 ft. 6 in.	....	....	....	....	....	Lowest, 5 ft. 6 in.; highest, 7 ft.
....	....	33	20·92	43·70	17·45	No frost found at 33 feet.
....	....	33	22·84	57·80	15·75	do 33 do
38 inches......	28 inches......	10	21·78	51·60	19·19	do 10 do
....	....	10	23·21	39·47	21·90	do 10 do
Avg. 5 ft. 10 in.	....	....	....	....	....	Information courteously given me by H. Jukes, Esq., C.E., engineer in charge. Surveyors employed by Winnipeg and Hudson Bay Railway Co.
....	....	12	25·31	50·18	16·51	No frost found at 12 feet from above downwards, height of bank 34 feet.
....	36 inches......	....	24·27	47·46	15·08	
....	....	16	....	....	....	No frost found at 16 feet.
33 inches......	Nil	17	21·18	41·86	15·01	do 17 do
....	37 in., 29 in....	....	....	....	....	37 in. white clay, 29 in. blue clay.
....	Avg. 1 inch ...	....	Rain and snow to Aug. 2, 9 34 51·03		Abt 16	
48 inches......	do 2 inches.	17				No frost found at 17 feet.
....	7½ to 9 inches.	....				Thaw dependent upon nature of ground; wet average 9 in., dry 7½ in.
40 inches......	2½ inches	....				No frost found at 17 feet.
....	10 to 12 inches	....				
30 inches......	10 inches.	....				do 18 do
....	Avg. 12½ inches	....				
....	28 inches	....				
....	10 feet	....				do 10 do
....	Avg. 18 inches	....			About 19·00	
31 inches......	do 14 do ..	18				do 18 do
3 do	65 inches..	....				A lodgement of 3 inches of frozen water over clay bed at 65 inches.
8 feet......	14 do	21				
....	....	*15				*Excavation. No frost at 15 feet.
....	30 inches......	....				
....	Avg. 36 inches	....				
....	37 inches	....				
....	Avg. 37¼ inches	....				
....	do 48 do ..	....				
....	40 inches......	....				

times freed from its winter's snow by the action of fierce easterly gales sweeping over Hudson's Bay,
downwards, but from its position, laterally, therefore having selected this, the most exposed site, I had
This last experiment is, in my opinion, conclusive, inasmuch as I consider it indicates the greatest
a scale so small as to be wholly comprised within 10 acres. To give an idea of quarrying in frozen

different diameters and lengths, ice chisels, &c.) explains the somewhat arbitrary appearance of some



FOX
CHANNEL
Lake Kennedy
CUMBERLAND GULF
Repulse Bay
Frozen Strait
Wager River
Roes Welcome
SOUTHAMPTON I^d.
C. Fullerton
C. Kendall
BELL I^d.
C. Queen
Kings Cape
Gordon Bay
META INCOGNITA
FROBISHER BAY
DAVIS STRAITS
HUDSONS STRAITS
Salisbury I^d.
Nottingham I^d.
CHARLES I^d.
DIGGES I^{ds}.
White Strait
Resolution I^d.
Buttons I^d.
HUDSONS BAY
Fisher Strait
SOUTHAMPTON I^d.
MANSFIELD I^d.
SMITH I^d.
Mosquito Bay
LABRADOR
Ottawa I^d.
CHART
Showing position and estimated amount of ice in Hudsons Straits in the beginning of July 1886
Track of S.S. Arctic
Track of D.S.S. Alert
Field ice - thus
Stations